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TABLE OF CONTENTS

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EDITORIALS

Scientific Misinformation

THE atom bombarders have again been filling the headlines, this time with the story of the remarkable achievement of splitting the hydrogen atom into helium atoms.

While much of this mishandling of scientific publicity in the newspapers is the fault of the newspapers themselves, it ought to be possible for scientists to take the tendency into account when they issue publicity or when they present the results of research—especially since all scientists must know by now that the press is looking for spectacular items, and that most newspaper offices keep permanently standing three or four perennial headlines:

Scientist Splits the Atom!
Transmutation at Last Possible!
New Element Discovered!

We are in doubt as to the best means of handling the question, as by now we are a little cynical about the ability of scientists to make their theories clear to other scientists, much less to non-scientifically trained newspaper men. Perhaps a committee to edit papers before presentation would prevent the giving to the public of misinformation or distorted facts.

In the same connection, surely something can be done to correct some of the psuedo-scientific superstitions which continually are presented. Perhaps the most shining example occurred a few years ago when every newspaper in New York reported to eight significant figures the speed of an automobile at Daytona Beach; and even so reputable and usually accurate a magazine as *Time* habitually reports motorboat speeds to six significant figures.

The danger in all this is not so much that the general public will be misinformed. The public is bound to be misinformed anyhow, about something; but there does lie a real disadvantage to the chemical profession and to the rest of the scientific fraternity in the fact that intelligent people, reading these accounts, are left with the impression that such examples of semi-charlatanism constitute the chief exploits of chemists and other scientists. The natural result is to discredit

science; and scientists are judged by the publicity issued by a spotlight-seeking few.

In particularly flagrant cases, of which the Columbia University artificial diamonds form a recent example, the intelligent newspaper editors and even the readers publicly brand the story for what it is. Unfortunately, the world's opinion directly affects the professional standing and economic status of every individual chemist.

Versatile Chemists

WE ARE publishing in this issue an article discussing the work of chemists in fields of activity outside of their laboratories. Such an article is particularly appropriate at a time when the Institute's medal has just been awarded to a chemist whose laboratory work has been valuable but whose greatest achievements have been in dealing with human beings.

In mobilizing American chemists and chemical industry, Charles H. Herty showed both a crusading zeal and a political acumen not usually associated with the cold, dispassionately analytical laboratory worker.

It would be interesting to see how far other chemists have been able to develop in directions not connected with scientific theory and practice. Does a chemical training increase the ability to analyze and handle general problems? The criticism has been made that the present-day requirements for a Ph.D. degree overload a man's mind scientifically at the expense of his initiative and to the detriment of his subconscious ability to coördinate extraneous facts.

At first glance the odds might seem against scientifically trained men in a non-scientific occupation; yet we see lawyers (members of a profession which is certainly as exacting in its preparation as the chemical profession) turning to positions as heads of corporations and as government officials. It may be argued here that law requires a higher order of intelligence than chemistry to start with—a contention which is quite possibly true. A lawyer faces the daily active competition of other men as intelligent as he; and there is probably no group in which the fit more quickly submerge the incompetent.

However, we should like to publish an article giving statistics as regards the success of chemists in other professions, or discussing particular non-chemical achievements of individual chemists. Much as we admire the fine qualities of this year's medalist, we should dislike to think that he is permanently unique. There ought to be young chemists whom we can point out as following in his footsteps.

Altruistic Chemists

CHEMISTS profit by the altruistic work of a man like Frank G. Breyer. His work, however, raises two questions: (1) where would the unemployed chemist be if it were not for people like Mr. Breyer; and (2) why is altruism like theirs necessary?

The answer to the first question is obvious: the fine work that has been done to the Unemployment Committee would not have been done, and certain chemists would now be in great distress.

It is a little less easy to see why chemists in time of prosperity do not realize the importance of a well-organized group for taking care of chemical employment, for taking measures to foresee trouble before it happens, and for acting in general as an economic guide to the individual. The Chemists' Club has tried to handle the situation through its employment bureau; but this task is not that of a club which must necessarily be composed chiefly of chemists in the Metropolitan District or chemists who frequently come to New York.

A nationally influential employment bureau, in touch with all of the country's chemical industries, would be of great benefit to chemists and would reduce much of the present economic waste. Universities now try to act as their own employment bureaus; and a large number of peripatetic personnel men must in the aggregate spend an enormous amount of money in railroad fares and of intellectual energy in interviews.

Initiative for the establishment of an all-inclusive bureau naturally does not depend upon the employers. Some such central employment board is, however, obviously to the advantage of the chemical profession. It ought to be one of the major objectives of The American Institute of Chemists; and we hope to see the day when the Institute is sufficiently powerful and wealthy to undertake this project.

In the meantime, the Unemployment Committee may well prove to be the nucleus of such a bureau—though funds for its work will be a little hard to obtain after the present employment crisis has passed. We can only hope that the committee will develop so efficiently as to make the value of its continuance obvious to everyone. The figures quoted by Mr. Breyer at the last meeting of the New York Chapter of the Institute indicate that there may be some such result.

If this is the final outcome, the entire chemical profession will eventually have reason to be as grateful to Mr. Breyer and his associates as the unemployed chemists are today.

Stepping Out

Chandler D. Ingersoll

Expansion of the theory that the chemist ought to be able to function outside of his laboratory. A suggested technique for approaching the sales field.

IN THE February issue of *The* CHEMIST the writer touched briefly on the thought that a chemist is one who exercises his technical training, no matter through what channels, and then presented a short elaboration of this idea as applied to the advertising field. It would seem worth while, at this present era of stringency through unemployment, to apply to other fields this broader horizon for the employment of chemical training, with the thought that it may prove suggestive to some who have not considered the utilization of their technical knowledge in other than strictly chemical positions.

In what follows the writer makes no pretense at personal sufficiency or expertism in the matters discussed but is merely concerned with a rational inquiry into the fundamental requirements of certain economic fields—to the end that chemists may visualize these fields to better advantage and ascertain their own personal fitness for branching away from their strictly laboratory positions into some one or other of the more active branches of business.

As to whether or not an individual chemist is qualified to enter the advertising field discussed in the previous article, or the sales field mentioned below, is a matter for that individual to decide. He alone best knows his own personal qualifications, and should be able to compare them with the successful personalities to see how far he may measure up to these preconceived ideas of personal fitness.

Before entering into a detailed discussion of sales work, it might prove

interesting to consider briefly a means of appraising one's individual fitness for a given task for which his present training may but imperfectly fit him; for self-appraisal is one of the most difficult tasks which man ever proposed to himself.

"O wad some power the giftie gie us
To see ourselves as others see us."

In such an undertaking we are in effect endeavoring to be both judge and claimant. Various proposals have been made in the past to cover this question under captions of self-criticism, self-analysis, etc. While the writer makes no critique of these various systems *per se* or of their probable adaptability to certain individuals, they generally lead to such a conglomerate of mental forces that the self-analyzer ends up with a bad case of either ego or self-abnegation.

I feel that the healthier approach to self-appraisal of one's qualifications should lean, as do laboratory investigations, on the continual proof of testing. We know in chemical speculation that the only sure way by which we can proceed confidently is to subject each step of our progress to laboratory proof of its actuality. This same plan should prove equally applicable to non-chemical fields, and I know of no group of people better able to handle its application than a group whose whole structure of training is based on this foundation.

The difficulties, therefore, to be encountered by the chemist in utilizing the laboratory method should not be of understanding it but rather in ascertaining the tenets of trade practice to which he must conform, and the interpretation of the results obtained.

IT IS NO PART of the present intention to attempt a survey of all trade practices and their corresponding tests, as such an undertaking would be encyclopedic in length and quite out of keeping with the present article. It is also quite doubtful if an authority could be found capable of singly undertaking the task, let alone the present writer. We will, however, attempt an indicative outline, from which the reader can orient his own prospective field of endeavor and ascertain suitable tests therefor.

Trade practices may be considered unwritten understandings covering a vast reservoir of customs, use, and tradition, which it is inconvenient to itemize and incorporate in contractual agreements or written law. It is quite impossible to make definite specifications on a man's credit, public good will, the actual value of a given sales effort, etc. We are

guided in judging them by past experience and general understanding, which have accumulated from the years and give us a basis for our action. Why sell raw sugar by the long ton and most other commodities by the 2000-lb. ton? The detailed answer might be casually interesting, but the effort in obtaining it would be out of proportion; the sufficient answer is custom and tradition. Thus, the chemist entering sales work can profitably set aside any previous tendency to scoff at tradition, and realize he must first ascertain and appreciate the value of its force before setting about to correct its idiosyncracies.

Added to these two foundation stones necessary to our undertaking—to wit, self-appraisal of our personal qualifications for the work in mind, and determination of the trade practices in that field—it seems worth while to mention a third, and that is that an individual must be honest in his desire to serve a useful purpose and must arrive at a sense of self-confidence in his ability to do so. I add this third point for the simple reason that all too often the comment is heard that a chemist out of a laboratory must be a faker or a charlatan or both—otherwise why isn't he back in his laboratory where he belongs? It is my hope to see the day when the chemist will be expected to be found in that capacity where he can accomplish most.

I WAS extremely interested, if not surprised, to learn recently of the adoption of a definite policy by one of our larger chemical companies whereby the laboratory has been designated as the recruiting field for the sales force as well as for plant superintendents. While we have witnessed many manifestations of this trend in the past through the setting up of dual sales forces in the way of technical experts on the one hand and straight salesmen on the other, the above instance is significant in that it wipes out the fine distinctions that have in the past said, "You're a chemist and can't hope to master the mystic art of salesmanship," and, "You're a salesman. Let chemistry alone or you'll get into trouble."

In the past a chemist seems to have been purposely classified as one possessing a fund of technical knowledge but no intelligent ideas about his fellow man. Likewise a salesman has been largely stereotyped as one with uncanny human perceptions, but absolutely without knowledge of materials or their uses. This arbitrary classification is happily breaking down. There are scattered evidences of a general admission that a chemist may be an intelligent judge of human nature; and among our successful friends in the sales department we find direct evidence that technical knowledge is of value in selling.

Perhaps it represents a break down of that booming slogan of the

past two decades: "Specialization pays." We are beginning to find weaknesses in over-specialization, weaknesses particularly disadvantageous to the individual who, for example, may have spent his life making rubber accelerators, and who finds now that the world, temporarily anyway, is not particularly interested in rubber accelerators. At any rate, we can today recognize certain advantages in a broader perspective for the chemist than he at one time felt necessary to the practice of his art.

Some years ago there was a heated discussion in England as to who would eventually rule civilization—the scientist or the politician. It finally came to a head, with Bertrand Russell representing the politicians and Haldane the scientists. Each of them wrote a booklet in substantiation of their claims and I recommend for the reading of chemists, *Icarus* by Bertrand Russell and *Daedulus* by J. B. S. Haldane. They represent a milestone in the age-old clash between realism and mysticism. The fallacy of this particular clash was that both authors acknowledged a premise that all scientists are realists and all politicians are mysticists.

We admit general use by scientists of realism in their prying for facts and of the over-use by politicians of mysticism—that psychology based on suggestion and obscure values. But just as we readily deplore the state to which all-mysticism-and-no-facts have brought politics, so we must concede that the scientist has been prone on occasion to give a certificate of fact-actuality to many of his conjecturings which do not deserve it. I might cite atomic structure, ions, electrons, and radio waves as illustrations. It would do each faction good to borrow somewhat from the other.

THIS argument might readily be transferred to the chemist representing the realist and the salesman the mystic. And I am prone to believe, even as in the previous case, that the straight salesman of the past has leaned too heavily on his mysticism and the chemist on his realism. Whether this conclusion be classified as theory or not, we find it substantiated today by the fact that modern salesmanship is learning to know the technical qualifications of its goods as well as the idiosyncracies of its customers.

Hence I appeal to that group of chemists who may be at present unemployed. There is no barrier confronting them which prevents their utilizing their personalities in combination with their chemical training; and I need not add that, little as we know of the infant science of psychology, we are fairly certain that all of us possess mental qualifications

which have been left more or less dormant and will respond to development.

THE sales field suggests itself particularly on account of the author's belief that the chemistry of use will dominate our technical field for the next decade. Happily also this field seems an excellent one in which to demonstrate a test of the type proposed.

If we were to seek employment in the sales department of a chemical industry, the first questions to be asked would be, "What experience have you had?" "What do you do?" "What have you sold?" etc., all of which might logically (as we have had little or no previous experience in this field) bring out a stammered protestation which would be tantamount to an admission of incompetency. And the average chemist is a fairly competent individual, even though he is often unskilled in the art of bringing his competence to the attention of others.

This experience would show us at the start that a requirement of salesmanship is to be able to bring the competence of yourself and product to the favorable attention of others. So, if we boil down our first rebuff into its essential we obtain the starting point of qualifications, and can commence a cross-examination of ourself on the one hand and a self-training on the other in order to ascertain more closely our personal fitness.

As mentioned above, we can here attempt only a few of the more apparent qualifications for salesmanship which hopefully will serve as an outline on which the reader may orient himself with further itemization.

Lest this qualification outline deteriorate into detailed recommendation for strached collars, gartered socks, and the elimination of perspiration odors, I will cover these by the thought that the average chemist is seldom liable to overdo his personal appearance—and the basis of much sales accomplishment and personal psychology unquestionably has its foundation in a clean shirt.

It has always seemed to the writer that among the major qualifications of salesmanship are a nice understanding of and ability to catalogue his fellow man, a modest audacity, and a wholesome philosophy regarding the intention of others. I do not imagine nor believe these qualifications alone constitute salesmanship, but an appreciation of them should put a man well on the road.

People are mean, hopeful, avaricious, good-natured, altruistic, philosophic, intuitive, analytical, gullible, or generous, according to their lights. Dispositions usually represent the resultant of a number of these characteristics, which combine to prompt our reactions toward daily contacts

and questions. Hence, see how far you can go toward sorting out human nature. It's an interesting game.

By modest audacity is meant a personal poise which permits a man to approach a situation or person without awe, wonder, or fear, but which curves his actions to fit the situation or the underlying disposition of that person. Whether the story of Daniel in the lions' den is fact or fiction, it shows a nice appreciation of fearless poise and quiet leadership.

Wholesome philosophy toward others almost defines itself. Little progress is made by starting with the assumption that the other fellow is a crook. If you have something worth while to present to anyone, it's reasonable to suppose he will be interested in it on the same plane in which you present it.

ANOTHER factor of importance to the technical man in the sales field is his technical knowledge. This finally should become a sizable leverage, to the chemists' advantage. The only observation I have to make in this particular is that you supposedly are entering the sales field because you believe you can use your chemical background there. My thought then is: Use it, don't parade it.

In final, the uses of chemistry are properly still in their infancy. We have learned a lot of facts which we have been sorting and cataloguing. Now comes the greater task of putting those facts to use. The force of technical knowledge in all its ramifications should be brought to bear on every nook and cranny of the world's business.

Annual Meeting

AN account of the proceedings of the Annual Meeting of The American Institute of Chemists will be contained in the June CHEMIST, together with the reports of committees. There will also be an account of the award of the Institute medal to Charles H. Herty, with a transcript of the speeches.

The Bureau of Mines[1]

By A. C. Fieldner

The chief engineer of the Experiment Stations Division, U. S. Bureau of Mines, outlines the work of this branch of the Government chemical service. A wide variety of problems in pure and applied chemistry.

THE United States Bureau of Mines was established by Congress in 1910 "to conduct inquiries and scientific and technologic investigations concerning mining, and the preparation, treatment, and utilization of mineral substances with a view to improving the health conditions, and increasing safety, efficiency, economic development, and conserving resources through the prevention of waste in the mining, quarrying, metallurgical, and other mineral industries."[2] Most of the technologic work coming under the provisions of this act is conducted at eleven experiment stations strategically located with respect to the mineral industries in various parts of the country.

The Central Experiment Station at Pittsburgh, Pa., is by far the largest of these stations. Its personnel, comprising some 250 chemists, engineers, and assistants, is devoted to problems relating to the mining and utilization of coal, the health of workers in the mineral and allied industries, the technology and safety of explosives and electrical mine equipment, and the metallurgy of iron and steel.

The Petroleum Experiment Station, at Bartlesville, Okla., with a staff of sixty engineers, chemists, and assistants, including employees paid by the state, is the second largest experiment station. It deals with problems affecting the production and refining of petroleum and the

[1] Published by permission of the Director, U. S. Bureau of Mines. (Not subject to copyright.)

[2] Amended Organic Act, approved February 25, 1913.

utilization and conservation of petroleum and natural gas. These two stations are housed in government buildings on property owned by the Federal Government.

The other nine stations are located on various state university grounds in buildings or quarters provided by the state; and these cooperate in part with state mining experiment stations or schools of mines on certain problems that are of local as well as national interest. The staff at each of these small stations varies from five to twelve technical, clerical, and other employees, the average number being seven. To a considerable extent the work of these smaller stations is governed by the needs of the district in which they are situated.

The Northwest Experiment Station, at Seattle, Washington, is engaged on the beneficiation and utilization of the coals and non-metallic minerals of the Pacific Northwest and Alaska.

The Pacific Experiment Station, because of its location on the campus of the University of California, conducts highly specialized research on fundamental metallurgical constants such as heats of reaction, specific heats, reaction velocities, and vapor pressures.

The Rare and Precious Metals Experiment Station, at Reno, Nevada, is experimenting on the more complete extraction of gold, silver, platinum, tungsten, molybdenum, and other uncommon metals.

The Southwest Experiment Station, at Tucson, Arizona, is concerned with the mining and metallurgical problems of the Southwest, especially those affecting the mining and treatment of low-grade copper ores.

The Intermountain Experiment Station, at Salt Lake City, Utah, deals more especially with the treatment of complex low-grade ores, lead smelting, and the problems of the small mine operator.

The Mississippi Valley Experiment Station, at Rolla, Missouri, seeks to prevent wastes and to increase efficiency in the important lead and zinc industries of the Mississippi Valley. The Bureau's ore-dressing studies are centered at this station.

The North Central Experiment Station, at Minneapolis, Minnesota, works on problems connected with the beneficiation and smelting of the iron ores of the Lake Superior region. Special attention is given to utilization of manganiferous iron ores and the flow of heat, gases, and stock in blast furnaces.

The Southern Experiment Station, at Tuscaloosa, Alabama, is devoted to the problems of the coal, iron, and non-metallic industries of the South.

The Non-metallic Minerals Experiment Station, at New Brunswick, N. J., carries on chemical engineering research on the treatment and

PITTSBURGH EXPERIMENT STATION

utilization of non-metallic mineral products. At present efforts are being concentrated on the extraction of potash from polyhalite, wyomingite, greensand, alunite, and other potash-bearing minerals.

The Bureau during the War

That chemistry has played an important rôle in the work of the Bureau of Mines is well known to the hundreds of American chemists who were engaged on war gas investigations under the leadership of Col. George H. Burrell. The gas research laboratory at Pittsburgh was the original nucleus around which was formed our justly famous Chemical Warfare Service. "Charley" Parsons, then chief chemist at the station as well as secretary of the American Chemical Society, registered the chemists of the country and thus made it possible for them to serve where their special experience and knowledge was of the most value.

Although this war work was taken over by the War Department in 1918, the contacts formed with the great army of chemists of the country has been of great value to the Bureau of Mines ever since the war period. Bureau chemists today find friends and wartime associates in most of the university and large industrial laboratories of the country.

The achievements of the bureau's leading chemists are well known to the profession. One need but mention Parsons and radium, Cottrell and electrical precipitation, Burrell and gas, Rittman and gasoline, Munroe

and explosives, Moor and helium, and Lind and radioactivity. The importance of chemistry was recognized in the appointment of Cottrell (much against his own wishes) as the third director of the Bureau.

At the present time 117 of the 265 professional employees are chemists or chemical engineers. According to the different fields of chemistry the staff may be classified as follows:

Chemical engineers and metallurgists	44
Analytical chemists	36
Physical chemists	30
Organic and biological chemists	7

Chemical Investigations of the Bureau of Mines

As outlined in the organic act, the investigations of the Bureau of Mines come under the following heads:

A. Safety and health.
B. Conservation of mineral resources and improvements in mining, preparation, and utilization of minerals.
C. Service to the governmental establishment.

Chemistry and chemical engineering, broadly considered, play an important part in most of the problems under these three heads. The laboratories of the Pittsburgh Experiment Station are devoted principally to health and safety research and to investigations concerned with the more efficient utilization of coal and its products. For example, the gas laboratory of this station, which started with a study of mine gases and ventilation, has now become one of the leading laboratories of the country for research on health and on accident hazards from toxic and inflammable industrial gases, vapors, and dusts. The excellent work of this laboratory is attributed to the wide experience of the staff with a variety of problems in this field and to their former experience in the Chemical Warfare Service. The health and accident investigations are made in cooperation with the United States Public Health Service, which details physiologists and pathologists to work with the Bureau chemists.

An Important Industrial Problem

One of the outstanding problems submitted to this section, following its reorganization after the War, was the designing of the ventilation system of the Holland Tunnel between New York and New Jersey. Analysis of the exhaust gases generated by a large number of automobiles

HOLLAND TUNNEL. THE VENTILATING SYSTEM IS BASED ON BUREAU OF MINES RESEARCH

and trucks under ordinary road conditions made it possible to compute the amount of carbon monoxide that would be given off in the tunnels. Experiments with human subjects indicated the maximum permissible concentration of this gas from the standpoint of health hazard. From these data it was possible to compute the amount of ventilation required for the tunnels.

Related to this problem was the development by Bureau chemists of an extremely sensitive carbon monoxide recorder, based on the use of multiple thermocouples in conjunction with a Hopcalite catalyst that selectively oxidizes carbon monoxide. Fourteen of these instruments daily note the concentration of carbon monoxide in the Holland Tunnels with an accuracy of 0.001 per cent.

The results of these investigations have formed the basis of ventilation design for other vehicular tunnels, such as the Liberty tunnels at Pittsburgh, Pa., the tunnel from Oakland to Alameda, California, and the tunnel under the Mersey, at Liverpool, England.

From the tunnel gas investigations to the study of the toxicity of ethyl gasoline and the exhaust gases from motors using ethyl gasoline was an easy transition. This problem involved the development of new apparatus and methods for the exposure of animals for long periods to accurately controlled and analyzed concentrations of exhaust gases in air. Some of the animals in these tests were exposed over a period of two years.

After the ethyl gasoline investigation was completed, the Bureau was asked by the American Gas Association to make a comprehensive study of substances which might be added to fuel gases to impart to them an odor or irritating action, so that the accidental escape of asphyxiating or inflammable gases into rooms might be recognized and thus give warning to persons exposed to the gas.

A large number of the most promising chemical substances were examined and the sense-affecting properties of fifty-seven of these were determined. Many ingenious methods for setting up accurately determinable concentrations of gases and vapors in air were worked out. These substances represented hydrocarbons, alcohols, esters, aldehydes, isocyanides, mercaptans, sulphides and other classes of organic compounds. The problem required the combined efforts of the physical and the organic chemist, the physiologist, and the psychologist working in the laboratory, and the chemical engineer who carried out field tests of warning agents in city gas-distribution systems.

One of the important objectives of the research was to find, if possible, a warning agent similar to the sneeze gases of the war which might awaken sleeping persons. Consultation with physiologists and psychologists failed to elicit any definite opinion as to whether odors or eye and throat irritants would awaken sleeping persons. It was generally thought that a gas which would cause sneezing or coughing would awaken people, but doubt was expressed as to whether an eye irritation or odor would awaken them. Obviously, no systematic experiments on the subject had ever been made.

Tests on Human Beings

To determine the effect of irritants in gases a sleep-test chamber was built at the Pittsburgh Experiment Station. The writer and his associate, W. P. Yant, now superintendent of the station, were the first subjects of the tests. Odors, even such disagreeable odors as ethyl mercaptan, were not effective, but extremely small concentrations of nose and throat irritants such as croton aldehyde, allyl alcohol, and capsaicin awakened all subjects on whom they were tried. Neither chloroacetophenone or capsaicin proved practical in gas-distribution systems, the former because its vapor pressure was too low to give sufficient concentration for warning and the latter because, being a dispersed solid, it did not carry any great distance through the distribution system.

Croton aldehyde was found to be the most promising warning agent for sleeping persons; but the estimated cost of 2.0 cents per 1000 cu. ft. for impregnating a gas containing 20% carbon monoxide is considered

prohibitive from a practical point of view. Ethyl mercaptan was the most effective warning agent of the odor type, and this material has since been used in detecting leaks in several large natural-gas distribution systems. The cost of this agent is estimated at 0.1 per cent 1000 cu. ft. of 20% carbon monoxide gas. Butylene and certain condensates from the cracking of petroleum were found to have odors resembling manufactured gas. Such materials are now being used in the odorization of natural gas on a large scale in California.

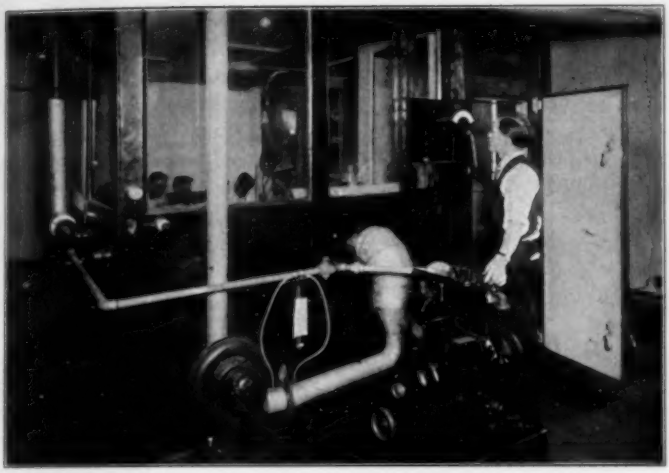
Study Chemical Problems in the Home

In recent years the Health Laboratory has given special attention to biochemical and pathological study of the effect of gases and vapors arising from new uses of chemicals in the home and in industry. Among them are methanol, used as an anti-freeze for automobile radiators; methyl and ethyl chlorides and bromides, and dichloro-difluoro-methane as refrigerants; ethylene glycol dinitrate as a constituent of explosives; and benzol, ethyl benzene, ethylene dichloride, dioxan, vinyl chloride, cellosolve, ethylene oxide, methyl formate, etc., for solvent and other purposes.

Parallel with the toxicity studies the Bureau is investigating the inflammability of gases, vapors, and dusts in order to recommend adequate ventilation systems and develop means for the prevention of ignition as well as for the limitation of propagation of explosions. Data have now been obtained from which the explosibility of gases from mine fires and explosions, automobile exhaust gases, blast furnace gases, and gaseous products from the detonation of explosives may be calculated from the analysis of the mixture in question. Upper and lower inflammable limits have been determined for these gases and for the vapors of the newly introduced organic liquids mentioned in the toxicity studies above.

Attack Problem by Fundamental Research

Three of the physical chemists of the explosives section of the Pittsburgh station give their entire attention to fundamental research on the mechanism of flame propagation and detonation. This program includes: (1) applying the concept of chain reactions to the study of explosions with ozone; (2) determining the flame temperatures of hydrocarbons of the methane and ethylene series by use of the sodium line reverse method; (3) controlling the direction of movement, the speed and the form of flames in inflammable gas-air mixtures by varying the strength of electric and magnetic fields surrounding the mixture; and



DETERMINING THE EFFECT OF SMALL PERCENTAGES OF CARBON MONOXIDE ON HUMAN BEINGS

(4) studying the influence of explosion pressure-waves on the ignition of methane-air mixtures and other explosives.

This type of research has involved the development of an ingenious optical method for photographing pressure-waves by utilizing the change in refractive index of the gas when compressed. For wave velocities higher than the velocity of sound in air the exposure must be of the order of a millionth of a second or less. Such an exposure is obtained when a powerful static spark is used as a means of illumination. By this means the transfer of detonation from one cartridge of explosive to another when the cartridges are separated by an air gap has been investigated. The detonation of the second cartridge is brought about by the transfer of the pressure-wave from the first cartridge. This wave has a critical velocity below which detonation of the second cartridge will not take place. These velocities have been measured by a wave-speed camera. From these findings it may be possible to measure the sensitiveness of explosives to explosion, by a method more precise than any now in use.

Conservation of Mineral Resources

A large part of the Bureau's work comes under this general heading. The forerunner of the Bureau of Mines, the United States Fuel Testing Plant of the U. S. Geological Survey, was concerned principally with the

conservation of coal through more efficient utilization. Research on the constitution and composition of the coals of the United States, on the mechanism of combustion in industrial furnaces, and on the cleaning of coal has been carried on continuously by the Bureau since its organization. This work has proved beneficial to the general public in that it has increased the efficiency of fuel utilization and has aided in promoting the use of smokeless fuels. The present standard methods for sampling and analyzing coal were largely developed by the Bureau laboratories, and most of the published analyses of American coals were made by the analytical chemists of the Pittsburgh station.

Survey of U. S. Coal Deposits

The coal analysis laboratory is designed for quantity output. More than a thousand samples are analyzed each month. Calorimetric determinations are made in a special multiple calorimeter designed and built in the Bureau shops. This apparatus contains eight calorimeters in one constant temperature bath. Temperatures are automatically controlled by thermostats, and the rise in temperature of the calorimeter is determined with electrical resistance thermometers. The water equivalent of each calorimeter is determined as a function of the rise in temperature produced by the combustion. Consequently, the laborious correction for "radiation" which is required with ordinary calorimeters is eliminated. Four analysts can make 200 to 250 determinations in an eight-hour day. Other determinations are likewise made in apparatus especially designed to save time and effort.

The present coal research program of the Pittsburgh station consists of a study of the constitution and composition of American coals in relation to their gas-, coke-, and by-product-making properties. Organic, physical, and analytical chemists, chemical engineers, and paleobotanists collaborate in this research. Dr. Reinhardt Thiessen, a paleobotanist, is one of the world's leading authorities on the origin and constitution of coal. His microscopic examination of thin sections of various ranks of coal by transmitted light has been of great service in unravelling the complex structure of coal. By the recognition of characteristic spore exines, pollen grains, and other plant entities, he has been able to identify and correlate coal beds that have heretofore baffled geologists.

The apparatus and method used in determining the gas- and coke-making properties of coal was developed in cooperation with the American Gas Association. Seventy-five to a hundred pounds of coal are carbonized in a cylindrical sheet-iron retort uniformly heated on all sides

in an electric furnace, at temperatures ranging from 500 to 1000 degrees Centigrade, with tests made at intervals of 100 degrees. In this manner the effect of carbonization temperature on the yields and quality of the coke, gas, and by-products is obtained throughout the range from low- to high-temperature coking. Since the temperature and other carbonizing conditions are closely controlled, it is possible to compare coals on a uniform basis and to study the influence of various factors such as moisture, size of coal, inerts, charging density, preoxidation of coal, etc. The 100-pound charge of coal is large enough to yield sufficient coke and by-products for analysis and physical tests and yet small enough for convenient laboratory manipulation and accurate control.

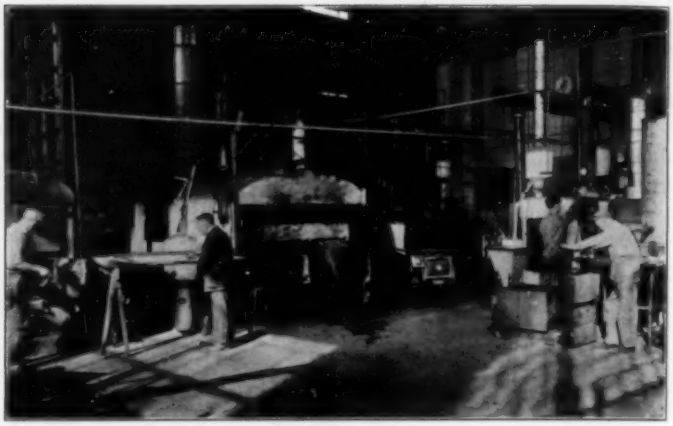
THREE GENERATIONS OF DOGS EXPOSED TO EXHAUST GASES FROM ETHYL GASOLINE

Seventeen different coals from various parts of the country have been examined by this method. In each case the coal was subjected to microscopic examination, extraction with solvents, and to physical tests such as agglutinating value, plastic range, softening temperature, and other tests which gave some promise of throwing light on the properties of coal. In this manner it is hoped to develop a better classification of American coals, which will aid in directing each coal to the use for which it is best suited.

Conservation in the Petroleum Field

By far the largest part of the work of the Petroleum and Natural Gas Division of the Bureau has to do with increasing recovery, reducing waste in production, and transporting these commodities.

From a national point of view, such work is more important than chemical research on refining problems. Some seven years ago when exhaustion of petroleum seemed imminent, the Bureau was charged by Congress to investigate oil shales and the recovery of shale oil. A full-scale Scotch retort and an American design of continuous retort were installed and operated at Rifle, Colorado. Enough experiments on mining, extraction, and refining were made to furnish a foundation of technical knowledge on which to build a shale-oil industry, if and when needed.



FUELS COMBUSTION LABORATORY

About the same time a limited amount of orienting research was started at the Pittsburgh Station on catalytic and high-pressure reactions between carbon monoxide and hydrogen with a view to producing synthetic fuels. Important fundamental information was obtained and published on the methanol equilibrium, methanol catalysts, and the production of synthetic hydrocarbons at atmospheric pressure by the method of Franz Fischer. Industrial interest in developments along this line grew with great rapidity and probably reached its climax at the time of the First International Conference on Bituminous Coal held in Pittsburgh in 1926. It was believed that the coal industry would be called on to supplement petroleum in order to satisfy the growing demand for liquid fuels. But soon afterward, developments in the cracking of petroleum and the discovery of enormous new reserves of petroleum completely changed the picture, so that today it seems unlikely that coal will be needed to supplement petroleum as a source of liquid fuel in the near future.

On the other hand, petroleum, and particularly natural gas, are threatening to curtail the use of coal still further. It is estimated that more than 600 billion cubic feet per annum of natural gas is blown into the air and wasted in the two States of Texas and California alone, and it is probable that one-fourth to one-third of the total annual production is thus wasted. Much research is being conducted by various agencies interested in the chemical utilization of some of this waste gas, and with

some degree of success. However, the production of chemicals from natural gas cannot consume any significant proportion of this vast quantity. A wholesale market can be found only by long-distance transportation to industrial centers, facilities for which are now in process of development.

At the Berkeley, California, station of the Bureau considerable progress has been made in using natural gas for the reduction of zinc oxide to metallic zinc of high purity, and likewise of iron oxide to metallic iron. The latter process would be particularly applicable to California, which has no coking coals.

Use Methods of Physical Chemistry

Chemists will be interested to know that these two processes were developed by the physical chemists of the station after they had made a thorough study of the thermodynamics involved. This laboratory with a staff of four physical chemists, specializes in the determination of fundamental constants of metallurgical processes. For some years they have been engaged on a program of measuring high- and low-temperature specific heats and heats of reactions of metal oxides and sulphides. Two valuable monographs have been issued: Bulletin 296, *Iron Oxide Reduction Equilibria, a Critique from the Standpoint of the Phase Rule and Thermodynamics*, by O. C. Ralston; and Bulletin 324, *Zinc Smelting from a Chemical and Thermodynamic Viewpoint*, by C. G. Maier.

Other studies of this station include: rates of reactions of various metallurgical materials, solubilities, vapor pressures. The objective of the Berkeley station is to make available to practicing metallurgists a list of properties of metallurgical materials that have been corroborated by the most careful scientific scrutiny and by correlation with the results of other workers. Such presentations have been accomplished in the case of iron and of zinc and are well under way for copper and lead. It is hoped to extend the work to other important metals such as manganese, chromium, nickel, tungsten, antimony, tin, etc. The correlated facts thus made available are of the utmost importance in the production of purer metal and in the possible development of an advantageous treatment for leaner and more complex ores.

Another important application of chemical research in the metallurgical work of the Bureau is in the five-year program of cooperative research on the physical chemistry of steel-making which is being conducted at the Pittsburgh Experiment Station in cooperation with the Carnegie Institute of Technology and the Metallurgical Advisory Board.

This study has resulted in important additions to our knowledge of the mechanics of open-hearth reactions, particularly with regard to deoxidation. A new alloy of manganese, silicon, and iron, well adapted to manufacture from domestic manganese ores, has been developed for the deoxidation of steel. Its development is a contribution toward the solution of the domestic manganese problem, as well as of the problem of increased freedom of steel from inclusions.

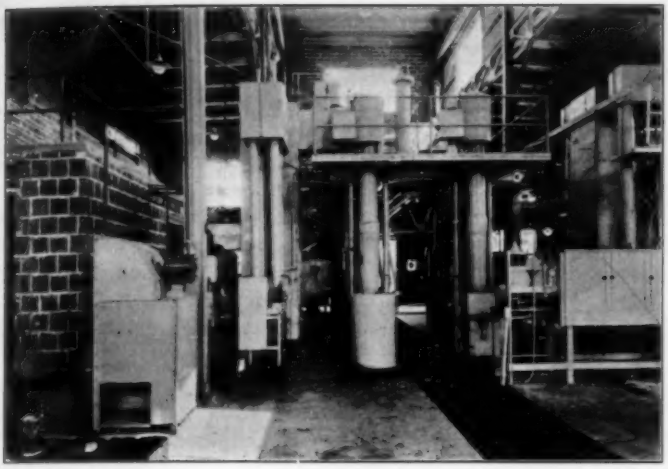
These examples are representative of the part that chemistry, and more especially physical chemistry, plays in the Bureau's metallurgical research program, which is organized to reduce wastes in the nation's irreplaceable mineral resources.

A Problem of the Future

The time is approaching when the metallurgist must treat mineralogical forms that were the discard of yesterday's mining operation. Whatever may be thought of man's future need of metals and of industry's occasional periods of "overproduction," it is essential to the well-being of man and the nation that the recovery and utilization of metals be upon an efficient and profitable basis. An accurate and complete knowledge of the physical and chemical properties of matter and energy involved in the transformation of ore to metal, and a detailed scientific understanding of the nature of these changes are essential in the conduct of the mining and metallurgy of tomorrow.

Although process development is not ordinarily considered a function of the Bureau of Mines, a specific act of Congress charged the Bureau with working out processes for the extraction of potash from domestic minerals. For this purpose a chemical engineering laboratory equipped with the usual unit operation, small-scale apparatus was installed at the Non-metallic Minerals Experiment Station at New Brunswick, New Jersey. Plans were made to investigate a number of potash-bearing minerals, including greensands, leucite, alunite, feldspars, and saline deposits. However, the coincident discovery, by drilling, of extensive beds of polyhalite ($K_2SO_4.MgSO_4.2CaSO_4.2H_2O$) in Texas and New Mexico led to the centering of efforts on this mineral, which heretofore had not been used as a source of potash. Several processes were developed on a laboratory scale which depend essentially on first calcining the polyhalite at approximately 450° C. and then extracting it with hot water. Potassium sulphate, schoenite ($MgSO_4.K_2SO_4.6H_2O$), or syngenite ($CaSO_4.K_2SO_4.H_2O$) may be obtained according to the subsequent treatment.

All these processes yield solutions or residues containing magnesium



HELIUM FROM NATURAL GAS

salts which may be utilized as a source of magnesium compounds or possibly metallic magnesium. More recently, experiments have been made on the reduction of polyhalite at temperatures above 800° C., with hydrogen and with carbon. It was found that the reduction of the potassium sulphate to sulphide was practically complete and that the calcium and magnesium remained in the residue on extraction with hot water. This method of treating polyhalite may have commercial possibilities for the manufacture of potassium compounds other than chlorides, even in competition with the sylvinite deposits now being mined in New Mexico.

Service to the Governmental Establishment

Probably the most interesting achievement of the Bureau of Mines from the chemist's point of view is the extraction of helium from natural gas on a commercial scale for the Army and Navy. This is an example of one of the service functions to the governmental establishment. During the last fiscal year, ending June 30, 1931, the Amarillo helium plant produced 11,362,730 cubic feet of helium for the government dirigibles. This plant was designed and built by Bureau engineers, and the process is based on the research work of the late Dr. R. B. Moore and his associates and successors in the Bureau. The average recovery for the last year was 85.6 per cent and the purity was 97.8 per cent. The net ex-

penditures from the treasury required to operate and maintain the plant and gas field averaged only $10.36 per thousand cubic feet of helium for the year. A new monthly cost record was established in June, 1931, when helium was produced with net expenditures of only $5.95 per thousand cubic feet.

When the United States entered the World War, helium had been obtained only in small amounts as a curiosity in scientific laboratories. The total quantity recovered probably did not exceed 100 cubic feet, and the cost of production was estimated at $2000 per cubic foot. It is doubtful if the proponents of helium at that time imagined it could be produced at anywhere near the present low figure. This project may justly be regarded as one of the great achievements of physical chemistry and chemical engineering.

Opportunities for Chemists in the Bureau

The foregoing sketchy review of the chemical work conducted in the Bureau of Mines shows that the chemist or chemical engineer has a fertile field in which to exercise his talents. He may specialize in various branches of chemistry or engineering. The best opportunities, of course, are open to the thoroughly trained investigator, especially to one who combines originality of approach with practical insight. Such an individual will soon establish a reputation for himself on some pioneering investigation which may subsequently open up unusual commercial opportunities. The Bureau of Mines has been an excellent training ground for men who later entered the mineral industries in research and development work.

On the other hand, the Bureau has also been a good place for scientists who wished to carry on research related to the mineral industries, untrammeled by commercial considerations. Such men are provided with laboratory facilities and assistants, and are assured a continuity of effort such as can be offered only by the larger endowed research institutions. They have the advantage of university associations and of close contact with the industry which they serve. Such have been the conditions up to the present time of economic stress. The story of the problems and accomplishments of the future must be awaited.

Pre-medical Courses in Chemistry*

By Jack P. Montgomery

How shall chemistry courses be organized to suit the requirements of the medical colleges? The opinions of a number of medical school deans.

PRE-MEDICAL courses are comparatively recent developments in education, but they were not designed or thought out by educational experts in the professional sense. They evolved because of necessity and in obedience to the law of supply and demand, which is older than education itself. Twenty-five years ago medical schools were actually competing for students, and any young man of good character and requisite finances could be sure of admission.

The situation began to change rapidly when the American Medical Association, with the able assistance of various State Boards, assumed what has been called a certain police authority over the medical schools. This resulted at first in a classification of medical schools as Class A, Class B, etc., grouping based mainly on the two criteria of student preparation and medical school efficiency, as measured in terms of faculty, equipment, and curriculum. Many of the weaker schools were forced to close, but others continued under the "B" classification.

At present there is but one classification—"Approved"—and under the more recent ruling still other schools have been closed. Today, therefore, the students, who are many, compete for places in the schools, which are few. This situation enables the American Medical Association to establish certain prerequisites which must be met by the student

* Presented before the joint symposium of the Divisions of Medical Chemistry, Biological Chemistry, and Chemical Education, New Orleans meeting of the American Chemical Society, March 28–April 1, 1932.

before he is eligible even for consideration, and, further, permits each medical school to exercise great selective authority in choosing from among the eligibles.

The radical reversal of conditions of selection and control did not occur all at once, as is frequently the case in educational administration, but was progressive. Just as progressively the various arts colleges have sought to prepare their pre-medical students to meet the changing conditions as they developed, thus definite pre-medical courses had their inception. From a small beginning here and there pre-medical courses have greatly increased in number and extent, being changed now and then according to the known demands or desires of the medical schools. The American Medical Association has an established minimum of collegiate preparation, embracing both time and subject matter; and to this fundamental prerequisite each medical school has added certain requirements of its own.

Makers of the programmes of pre-medical students have little difficulty in ascertaining the minimum requirements of the Association. It is quite another matter, however, to keep in touch with the demands which the medical schools have superimposed upon the minimum requirements. The administration of most of our pre-medical courses is in the hands of arts college faculty members who must know just what courses the students should have, how they should be taught, and to what end. In this particular there has been developed a sort of salesmanship under keen competition.

No Agreement on Proper Chemical Training

Even a casual study of the situation shows that there is more variation and a greater diversity of opinion concerning chemistry courses than in all the other subjects combined. In chemistry the published minimum requirements of the Association are easily understood. They can be met very easily and are readily completed in less than two years of college work, thus giving the student time to satisfy the remaining forty-eight hours assigned for completion in two sessions. When we turn to the added requirements of the medical schools our troubles begin, and doubts arise as to whether or not we are adequately preparing our pre-medical students in chemistry.

Naturally, our best sources of information are the medical schools themselves. What follows is very largely the composite opinion of the deans or other officers of more than eighty of the medical schools as expressed in recent letters. "It has always been difficult to plan the work

of a (pre-medical) student to accomplish the broad cultural and humanistic background and at the same time meet all the specific requirements. At the present time each medical school interprets its own requirements very liberally.... Why not, then, simply publish what is already more or less of a general policy?"

Hitherto the medical colleges have not seemed inclined to commit themselves to this extent. Now that the representatives of so many medical schools have so generously responded to requests for information and have contributed discussions of the subject, we who are responsible for making up pre-medical curricula, being informed of their general intentions, are in a position to strike a happy average.

Fundamental Requirements

Just what do the approved medical schools expect and desire their freshman students to know in chemistry? It is generally accepted that the four years of medical study can well be divided into two equal periods, the pre-clinical and the clinical. Physiological chemistry, or biochemistry, is given in the pre-clinical period and when thoroughly learned becomes the portal to all the chemical aspects of the remainder of the course. It has become very important, therefore, for the freshman in medical school to be able to carry on well from the beginning in physiological chemistry. Certainly this means that the biochemical viewpoint should be introduced early in pre-medical chemistry courses and that this viewpoint should be developed both in subject matter and preparatory technique.

To quote a prominent dean, "The relationship which chemistry bears to an accurate study of metabolic and other diseases and to research makes a comprehensive knowledge of the subject particularly valuable and desirable." Another dean says, "Many of the important advances made in medicine in the past twenty years, and those still in progress, are in the field of biochemistry; and much of modern medicine is, to a large extent, applied biochemistry. We, therefore, regret the increasing difficulty in teaching biochemistry because of the fact that students are inadequately prepared."

Other comments along the same lines may be summarized to mean that the medical schools desire their freshmen to have about the following equipment in chemistry:

(1) An intellectual appreciation of chemistry as a science in its universally useful aspects.

(2) Thorough grounding in those principles which are most general

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(2) Thorough grounding in those principles which are most general

in their applicability, resulting in a unification of the entire chemistry course.

(3) Adequate training in outstanding theories, not as a means of explaining facts, merely, but as a useful method of developing the quality of comprehension.

(4) An ever-increasing ability to blend the contributions of chemistry with the contributions of other sciences in his appreciation of life processes.

(5) Appreciation of the quantitative method in developing a sense of proportion and in increasing technical skill.

(6) The realization that, although his previous training may have been quite broad, much of what he has learned is now ready to be profitably applied to and incorporated with his acquisition of biochemistry.

Special Pre-medical Courses?

In discussing the content of pre-medical chemistry courses we are certainly upon safe ground if we assume that the teaching should result in a contribution to general education and educative processes quite as much as it results in meeting the needs of pre-medical training; and yet there is an insistent demand that separate sections be organized for pre-medical students. It seems to be the decided opinion that the chemical training of pre-medical students has not been given sufficient attention. It is deplored that the custom seems to have been adopted of forcing these men through a routine set of courses primarily planned for those intending to become chemists.

Yet, running through these appeals for courses more specifically pre-medical, there is the appeal that broadness in educational outlook shall not be sacrificed. Many are of the expressed opinion that the character of instruction given is of far greater importance than a required number of courses in so many subjects. Unification of interest, sequential development, deep comprehension of principles, and the quantitative attitude are greatly to be preferred to diverse interests in following routine procedures which may cause the student to be "lost in the mazes of a spurious accuracy."

As to the specific content and methods of presentation, there seems to be a great uniformity of opinion, although a few have ideas which, in the light of the majority expression, were somewhat radical. In discussing general inorganic chemistry it was well agreed that motivation should not be from the standpoint of the particular interest of the teacher, the former methods of the department, or application to indus-

try, but more as a part of general education directed to the specific blending with medical education. Pandemic chemistry is decidedly taboo. The ideal should be to overcome the lack of initiative and sense of responsibility for their own education which so many students reveal, and to lead them to think for themselves, to the end that they will not fail in the retention of knowledge of fundamental principles and facts or in the realization of what is retained when encountering new relationships and applications in later work.

The course should be an eight semester hour one, with half the credit time devoted to laboratory. Stoichiometry should be included to an extent sufficient to make the student appreciate the quantitative attitude. Some of the concepts of physical chemistry should be introduced and their exposition made a part of the laboratory work. Instead of many details and facts, comprehension of general principles should be stressed. The class work should be largely in the non-metallic field, but the last half of the laboratory work may well be in qualitative analysis, with the introduction of a few quantitative exercises. Sufficient energy relations should be included to convince the student that chemistry is not merely the study of matter.

If, as is frequently the case, organic chemistry is taken in the second year, motivation may well be directed along two lines, making it as far as possible a continuation of general chemistry, and, specifically, an illumination of chemical constitution whereby there are established genetic relationships between apparently diverse substances, and the demonstration of repetition in types of union, in substituent groups, in types of reactions, and in application of theories. Some of the concepts of physical chemistry may be given new applications and the quantitative attitude should be further developed.

At the present time it seems unwise to insist upon more than six semester hours in organic chemistry, but two additional hours should be provided wherever possible. Certainly when it is known that large numbers of students in the pre-medical course may apply to medical schools requiring or desiring eight hours, the longer course should be given. In any case both aliphatic and aromatic divisions should be included. The desired allotment of laboratory work seems to be that half of the credit hours shall be devoted to that phase of the course. Organic preparations, merely, seem to be of little value unless each one illustrates an important principle. Rather let the laboratory work be an integral illustrative item of the didactic work. A few suggestions have been made that we may well substitute physical chemistry or quantitative analysis for organic laboratory as usually given.

It is obvious that if more chemistry than that included in the Association's minimum suggestion is to be given it will be necessary to increase the time of our pre-medical course to three years. This has already been done in many colleges, and practically all are advising pre-medical students to complete four years of work and win the A.B. degree, including, of course, all possible pre-medical subjects.

What further courses in chemistry may then be taken with profit? A practically unanimous answer is quantitative analysis. A few say more qualitative analysis. Many desire physical chemistry but not as now taught.

The general consensus as to quantitative analysis seems to be that for pre-medical students it should be largely volumetric and colorimetric. It may serve the triple purpose of further unification and appreciation of the former courses, of further exposure to some of the concepts of physical chemistry, and of direct preparation for some of the laboratory procedures in physiological chemistry. Routine methods must not be allowed to rout comprehension, but a reasonable accuracy must be demanded. The ideal is to deliver the student to the instructor in a physiological chemistry laboratory with a knowledge not only of how, but of when and why, to proceed. At least two, but preferably four, semester hours should be devoted to quantitative analysis.

Change Needed in Physical Chemistry Courses

Turning finally to physical chemistry, many comments are to the effect that as now given in most colleges it is useless to the medical student. At the same time there is a recurrent demand that the physical chemistry viewpoint as applied to biochemistry be given in as large measure as possible. A few suggestions have been made that an entirely new kind of physical chemistry course ought to be devised and introduced especially for pre-medical students. A much wider view seems to be that it is possible to give the pre-medical student all the physical chemistry needed if general inorganic, organic, qualitative, and quantitative courses are unified from the physical chemistry standpoint.

College departments of chemistry are thus directly challenged by the medical schools to fill a rather large order. Chemistry must be taught adequately by divisions of the subject, general, organic, analytical, physical, and the like; but for the pre-medical student both sequence and unification must be kept in mind and carefully observed. It is hoped that as we learn more and more of what the medical schools expect of pre-medical courses in chemistry the departments of chemistry throughout the land will adequately meet the need

Committee on Unemployment

By Frank G. Breyer

The chairman of the Committee on Unemployment and Relief for Chemists and Chemical Engineers in the Metropolitan Area discusses the progress the committee has made.

SINCE the mass meeting on March 4th the volunteer committee on unemployment in the Metropolitan District has changed its status. It has received official endorsement from the ten technical and professional societies which sponsored the mass meeting and is now operating as their joint medium for professional relief. Headquarters have been established in offices at 300 Madison Avenue, New York City, where a permanent staff is engaged in the committee's three major tasks of registering chemists, collecting funds, and administering relief.

The first problem has been that of registering the unemployed chemists; and it may be interesting to examine the requirements for such registration, contained in the following form. A mimeographed copy is given to all chemists who apply for registration.

Committee on Unemployment and Relief for Chemists and Chemical Engineers

Information for Applicants for Registration

The Committee on Unemployment and Relief for Chemists and Chemical Engineers (hereinafter referred to as C. U. C.) is sponsored by the following societies:

American Chemical Society (New York and North Jersey Sections)
American Gas Association
American Institute of Chemical Engineers
American Institute of Chemists

Association of Consulting Chemists and Chemical Engineers
Compressed Gas Manufacturers Association
American Electrochemical Society
Society of Chemical Industry (American Section)
Société de Chimie Industrielle (American Section)
Technical Association of Paper & Pulp Industry

These ten societies have united in promoting the formation of C. U. C. with a twofold purpose: First, the committee aims to do what it can to provide positions for applicants who register with it. Chemical positions will be obtained if possible; if chemical positions cannot be obtained, an effort will be made to obtain relief work through the emergency work bureaus of the Gibson Committee, the Bliss Committee, the Straus Committee, and other unemployment committees for relief. Secondly, C. U. C. will undertake to raise funds to carry on this work and to supplement the limited assistance that can be obtained from the other organizations.

Arrangements have been made for close cooperation between C. U. C. and the other public organizations for unemployment relief. In this connection it is necessary for the registration committee to decide whether or not applicants for registration are eligible for aid.

Requirements for Registration

An applicant for registration with the Committee on Unemployment and Relief for Chemists and Chemical Engineers must be more than twenty-one years of age and must possess a professional status as specified in one or more of the five sections given below:

I. That the applicant is now a member or was formerly a member of one of the ten societies listed above, or

II. That the applicant is a licensed chemical engineer, or

III. That the applicant is a graduate from a college or university in a chemical engineering course and has received a diploma to that effect, or

IV. That the applicant is a graduate from a college or university in a chemistry course and has received a diploma to that effect, or

V. That the applicant has had four years or more of experience in chemical work* of a nature satisfactory to the committee.

* The term "chemical work" as used above includes teaching, chemical research or development work in the chemical field, and the supervision and control of chemical operations. Insofar as it is difficult to define the term "chemical work" with great precision it has been decided to give the committee freedom of judgment in any questionable case. It is thought that the requirement of four years' experience will

The term "member" in Section I shall be understood to include "fellow," "associate," "affiliate," "junior," or member of any grade except a student member.

In addition to the possession of the required professional status an applicant for registration must have resided in the Metropolitan Area —a radius of 50 miles from New York City—during the past year, except in a case in which an applicant, whose home or office or both are in the Metropolitan Area, has been away on a temporary assignment.

Although the possession of the above requirements as to status and length of residence in the Metropolitan Area entitles an applicant to register with the C. U. C., he must possess the following additional requirements for unemployment relief work to entitle him to consideration by either the Gibson Committee or the Bliss Committee:

For consideration by the Gibson Committee he must have resided in New York City for one year immediately prior to Nov. 1, 1931.

For consideration by the Bliss Committee he must have resided in New York City for two years immediately prior to Nov. 1, 1931.

For consideration by either committee he must be destitute, and, furthermore, those in the greatest need are given priority in the assignment of relief work. Priority is also determined by the earliest date of registration.

This condition of affairs compels the C. U. C. to obtain all of the information called for on the registration card and especially that showing the degree of need such as "family income," "other resources," "living arrangements," "amount and kind of liabilities," and "number of dependents."

The applicant should read carefully the "Instruction Sheet for Applicants" and fill out the registration card correctly and fully as directed therein. The information given on this card determines his eligibility to unemployment relief work and also establishes his priority classification in the assignment of such work.

Both the Gibson Committee and the Bliss Committee investigate each man to whom they assign relief work, and the applicant is cautioned to make his statements correct to the best of his knowledge and belief.

The registrar of the C. U. C. investigates the professional status and residence of each applicant and no application is accepted for registration unless the requirements have been met both as to professional status and residence in the Metropolitan Area.

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eliminate many cases where there is reason to doubt that the applicant merits consideration as a member of the chemical profession.

The Committee on Unemployment and Relief for Chemists and Chemical Engineers, in acting in the capacity of agent for public relief committees, is endeavoring to obtain the kind of emergency relief work for which professional chemists are especially fitted, such as actual chemical work or else the supervision of emergency relief work that is being done by other classes of workers. In this capacity the committee has already been successful in obtaining work for a number of applicants.

The C. U. C. is also endeavoring to raise money from members of the chemical societies in order to provide emergency relief work for those that cannot be taken care of by the Gibson Committee or the Bliss Committee. Some money has already been raised in this way and it is hoped that a sufficient amount will be obtained to enable the committee to provide unemployment relief jobs for men who are not eligible for aid by the Gibson or Bliss Committees. Such men would receive $15 a week, although it is possible that in certain cases $25 a week might be given as a maximum unemployment relief salary. The $15 a week salary would be paid to those working three days a week, while in certain cases $25 would be paid to men who work six days a week.

The committee hopes to raise enough money to be able to make small loans to professional chemists who are in unusual or desperate circumstances, such as being in imminent danger of losing their homes through a mortgage foreclosure or being liable to be dispossessed. However, the amount of money raised up to the present time has not been enough to do very much in that direction.

Chemical Employment

The C. U. C. places chemical men who have registered with the committee in regular chemical positions when such positions are available. All chemical positions in the Metropolitan Area which are referred to our committee are filled by selecting men who are registered with the C. U. C. if any can be found having the necessary qualifications. A few such chemical positions are available from time to time and some of them have been filled from our registration list.

FRANK G. BREYER,
Executive Chairman, C. U. C.

* * * *

Applicants are also asked to fill out a card showing their chemical experience and educational training and another card giving the following information about their financial status:

Committee on Unemployment and Relief *for* Chemists and Chemical Engineers

Name.....Date.....

Address.....Phone.....

TO BE FILLED OUT BY APPLICANT

Physical condition.....Living arrangements.....

Amount and kind of liabilities.....

Age at leaving school....How long will resources last if unemployment continues?...

Are you in need of immediate financial assistance?.....

Are you getting relief or assistance from any other source or agency?.....

Do you have access to a laboratory in which to work?.....

Have you ideas on which you could work if you had access to a laboratory?.....

Are you registered with the Chemists' Club Employment Bureau?.....

TO BE FILLED OUT BY INTERVIEWER

Personality rating (1)..... Group worker.....

(2)..... Individual worker.....

(3)..... Ever handled men.....

Interviewed by.....

TO date there have been registered 455 chemists and chemical engineers, qualified as regards both education and training. An additional 93 registrants, although not graduates, are men who have been affiliated with the chemical industry for most of their lives. There are also a few students. This unqualified list is made up of:

Students.....	22
Technicians.....	30
Engineers.....	11
Pharmacists.....	30
Total.....	93

Of the 455 qualified registrants 197 are in actual want. In many cases they are without funds and subject to charity. The others have

funds which may last a few months. Length of unemployment is as follows:

More than 12 months.....	51
8 to 12 months.....	83
4 to 8 months.....	124
Less than 4 months.....	197

As regards professional qualifications, 127 registrants are recognized members of chemical societies, 235 are college graduates with experience, 52 are recent college graduates with no experience, 41 are non-graduates but have had at least four years' industrial experience.

While employed, the registrants were in the following classes as regards salaries:

Over $5000 per year.....	47
$3600 to $5000.....	83
$2400 to $3600.....	109
Below $2400.....	216

Since January 1, 1932, there have been registered 26 qualified women chemists.

The Collection of Funds

Money has been sought from two sources: from the treasuries of the societies sponsoring the committee and from the societies' individual members. Response to the appeal to the organizations was gratifying—and especially so as these preliminary funds were necessary for organization of the committee in such a way as to make the collecting of further funds possible.

With these funds as an aid for the further work of the committee, the following letter was sent out. Response thus far to this appeal has been most gratifying.

April 22, 1932

Fellow Members of the Chemical Profession:

More than one hundred members of our profession in the Metropolitan District are in want. Their families are approaching despair. Fifteen hundred more are out of employment. Some have been unemployed for over a year.

Professional fellowship and human sympathy demand that the more fortunate of us contribute to the immediate relief of the destitute of our

profession. Public relief funds administered by the Gibson and Bliss Committees are running low. They are inadequate to meet the general situation and can no longer be counted upon to take care even of the most desperate cases.

This committee has been organized by the local sections of all the important national chemical and chemical engineering societies. Administrative costs will be paid from funds given specially for this purpose. Your contribution will be applied directly, immediately, and sensibly to the relief of chemists and chemical engineers.

We feel the best temporary solution is to finance the work of the Committee on Unemployment and Relief for the period April 25th to July 1st. $15,000 is required. An average of $5.00 per month for two months from 1250 men will give $12,500. We can get $2500 from other sources. Won't you send by return mail a contribution? Less than $5.00 if you can't afford it. More than $5.00 if you are able. To be followed by an equal sum one month later.

THE NEED IS IMMEDIATE AND URGENT! Unless we who are more fortunate respond generously many members of our profession face real want, demoralization, and tragedy.

FRANK G. BREYER
Executive Chairman

Checks should be made payable
to R. T. Baldwin, Treasurer.

Four thousand letters were sent out on April 26th. At the present writing (May 16, 1932) $3000 has been collected from 300 contributors.

The funds collected are being used chiefly in an attempt to find positions. The Metropolitan Area has been divided into 18 districts, covered by six solicitors who receive from the committee salaries of $15 to $20 a week for canvassing the chemical manufacturers of this district. They hunt primarily for chemical jobs, but may also place desperately needy chemists in non-chemical work, to be paid by the unemployment committee.

The non-chemical character of this emergency work is one of the strict requirements of the committee, as it does not wish to allow relief recipients to displace chemists who already have jobs. An exception to this rule is made in the case of hospitals, where many chemical determinations are now being done by physicians who can more advantageously spend their time on medical work.

Thus far the committee has placed 47 men in permanent positions and 74 in temporary positions. Most of these positions are with the chemical organizations. Twenty other positions as yet unfilled have been filed with the committee.

Portion of Memorandum Relating to the Defense of New York City against War Gases

By Bela Gati

Other Advantages of the High Ventilator Duct.—In large cities the air to be breathed in is generally bad. I cite only one example, the house where I am living. The building has 6 stories with 36 appartments. The Armenians use probably mutton fat, the Italians olive oil, the English people ox fat, the Hungarians swine lard, the Southern people crisco or cotton seed oil, and so on, corn oil, paprika, onion, leek, and if some calamity happens in ONE kitchen, the dumb waiter ducts broadcast this event in the whole house. We do not feel much consciously, but the smelling instinct works UNCONSCIOUSLY and because of the bad air, the organisms accummulate an abundance of oxigen in the tissues. This is a very disagreeable feeling and the individual tries to get rid off this superfluous oxigen. The alcohol is the simplest remedy, also the morphin, cocain, nikotin, and so on. To avoid the bad effects of the alcoholic addictism the United States spends inmeasurable sums for the noble experiment of the prohibition. A supply of good air would be more effective and certainly cheaper remedy. The air above the roofs is generally good enough, it is surely free from the most irritating kitchen odors. When I was in the service of the late Austrian-Hungarian Navy, I have felt once in a half an hour distance the odor of Sebenico. We could not see yet the city, but its smell was spreading over distances of miles. In this respect New York is excellent, no New York smell can be felt on the sea, however the singular houses, the inner appartements are terrible from this viewpoint. Everybody inhales this infected air during 8–12 hours daily. The missing sun beams are substituted by the modern sun lamps; a better house ventilation is badly needed. It can be done with combination of the war gas defense. It does not cost one millionth part of the DOPE expenses of the people.

The Chemist in the Department Store

By Ephraim Freedman

The head of the Bureau of Standards of R. H. Macy and Company describes the work of his laboratories. Chemistry as a safeguard to the consumer.

THE employment of chemists by department stores is hardly a new thing. As soon as department stores began to sell drugs, they employed chemists in order to satisfy the legal requirements of the state. These chemists were known as pharmacists. They were more or less versed in botany, physiology, pharmacognosy, pharmaceutical chemistry, microscopy, materia medica, and kindred subjects. They were called upon to package and label the drugs commonly used in the household, to fill prescriptions, and to compound the comparatively few creams, lotions, and galenicals carried by drug stores of the day. The food products which they manufactured were restricted chiefly to flavoring extracts such as vanilla and lemon.

As the trade of the nation increased, and as the cost of operating drug stores mounted, pharmacists generally found it more profitable to purchase most of their preparations from manufacturers, and devote such time as they could spare from the compounding of prescriptions to the sale of an ever-increasing number of diverse articles, ranging at the present moment from alarm clocks which awaken one in time for a hurried breakfast at the drug-store fountain to bedroom slippers, the month's best seller, and Mazda bulbs.

As transactions increased in the drug departments of department

stores, it was found expedient to institute manufacturing and packaging departments for drugs and foods. The increasing demand for cosmetics indicated the advisability of pushing the sale of one's own brand.

The employment of the analytical chemist followed. While in most instances the same chemist managed the manufacturing and analytical problems, here and there an analytical chemist was employed, on part time or full time, to test raw materials and finished products for strength and purity, and to study the composition of preparations in popular demand. Cosmetics, cleaning compounds, household remedies, and perfumes were occasionally analyzed. Now and then, a piece of fabric was immersed in a boiling solution of caustic soda for the purpose of finding out whether or not it was really all wool or if cotton was also present. The activities just mentioned cover (and are still embodied in) the work of the manufacturing and the analytical chemist.

A new field for chemistry, however, shortly appeared upon the horizon. After the great war, money became very plentiful and the purchasing power of the public increased by leaps and bounds. It was hardly necessary to urge people to buy. On the contrary, the public was eager to spend money. Greater varieties of higher priced merchandise found their way to market and were gobbled up. Advertising on a large scale confronted us everywhere and frequently fed us very alluring, albeit half-baked, claims as to the worthiness of countless products. The credible public bought on faith.

New Merchandising Methods Necessary

But it soon became evident that conditions could not always remain so. Furthermore, since every-one was using superlatives, some new angle of attack was necessary. A very logical solution presented itself, one which would actually prove of material and lasting benefit to all who heeded. This solution dealt with the problem of consumer acceptance of merchandise.

Once this idea had taken seed, it was found necessary to rate merchandise in terms of actual value to the consumer. The examination of merchandise assumed a broader aspect. To the study of market trends and styles, was added the study of hidden values. Was one article *really* stronger or more durable than another? Would it actually do what was claimed for it? Would it be likely to harm the user? Could it be cleaned or renovated without having its life of usefulness shortened materially?

And so, in this way our Bureau of Standards was inaugurated, on Au-

gust 23, 1927, to aid in purchasing and offering for sale merchandise of the highest quality at the lowest possible price.

The program called for:

1. Analysis and comparison of offerings of manufacturers, thus helping to determine best value.
2. Testing for performance and durability.
3. Examination of materials returned by customers for adjustment.
4. Collection and classification of information received, for the purpose of drawing up specifications for the standardization of merchandise.

And now, for that personal talk on "The Work of the Chemist in the Department Store." The subject *should* be "The Work of the Consumer Research Chemist and Engineer in the Department Store," for it embraces many things beyond the confines of chemistry. It not only deals with the chemical and physical properties of merchandise, for it battles indifference, chicanery, and fraud and encourages truth and honesty and fair-dealing. Its motto is *Servabo Fidem* (I will keep faith) and its password—"Know thy merchandise." Above all, it is a study of men and the ways of men—for as our learned biblical scholar, our dear friend Dr. Harold, would say, "By their *works* are they known."

Over fifty thousand specimens have passed through my hands in the past five years. All types of merchandise are included; and to enumerate them all would be a tedious task.

More textiles are examined than any other class of merchandise. If you will glance about, the reason will become quite apparent, for as you can plainly see, we are almost completely encased in them. Beside wearing apparel there are household linens, draperies, awning materials, tentage, sewing threads and twine; then again paints, varnishes, fuels, foods and drugs, products of wood, metal, rubber, stone, and paper; natural products and synthetic imitations. Rather than bore you with statistics, I shall relate a few episodes which I trust will prove not only interesting but profitable.

Catching a Law Breaker

Some years ago we found silver polishes with cyanide and others with mercury. We banned their sale and warned a certain manufacturer against the use of cyanide because of its deadly nature. Shortly afterward the City and State of New York also forbade its use.

The manufacturer whose cyanide-bearing product could no longer be sold submitted a new preparation which upon analysis proved to be harmless. Every now and then we checked his product.

One morning, I noticed his demonstrator do a marvelous job of shining up a piece of tarnished silver. My suspicions were aroused and confirmed, and the merchandise was taken off sale at once.

The manufacturer was asked to report to me. I asked him why he was violating the law and was dumbfounded when he replied: "Cyanide isn't poisonous, is it?"

The following statement was issued. "In view of the fact that Mr. Doe was warned by the writer to desist from putting cyanide in his product two years ago, and furthermore since he is considered as being an irresponsible person, it is urgently recommended that orders be issued enjoining our buyers from purchasing his products."

Protecting the Customer from Poisons

In December, 1930, my attention was directed to a certain depilatory for which the following claim was made, "...will induce baldness wherever applied, when used as directed."

Examination of this product disclosed the presence of thallium acetate.

An inquiry to the U. S. Department of Agriculture resulted in the following reply: "In regard to your inquiry...regarding the toxicity of thallium the Administration wishes to advise you that thallium and its salts are very toxic. Thallium is absorbed through the skin and exhibits its toxic symptoms after a period of several days. No antidote is known for this product. For this reason it is our opinion that thallium used in any preparation recommended as a depilatory would be injurious to health."

Our people were immediately notified not to purchase this or any other cream containing thallium.

In addition to the Administration's comments, there appeared from time to time numerous articles describing the toxicity of thallium. Numerous reports of poisoning from depilatories containing thallium have appeared in recent literature (vide *The Journal of the American Medical Association*). So, through the work of the consumer research chemist in at least one department store, many persons have undoubtedly been guarded against illness and possible death.

Loop-holes in the Law

A pretty rectangular metal cigarette case, lined with wood and surmounted by a shaggy dog was described as being made of "Japanese silver." A hurried qualitative test for silver proved negative. A week later the vendors entered my office and demanded to know why their merchandise was not purchased.

I tested a small sliver of metal from the specimen in their presence and ran two check tests using a drop of a weak silver nitrate solution for one, and a minute particle of silver for the other. Apparently any silver that might be present was too negligible in amount to be observed by this test.

Their reaction was amazing. They had imported it as "silver-plated" and would produce the necessary papers to substantiate their claims. They submitted a broker's report which reads as follows: "After analysis by U. S. chemist at appraiser's store it is reported that the above articles are unquestionably silver-plated."

A CORNER OF THE MACY LABORATORIES

We thereupon conducted a quantitative analysis which disclosed 7.8 milligrams of silver on an article having a surface area of 416 cm.^{2} and weighing 182 grams. The per cent of silver in the article was calculated as being only a little over four one-hundredths of one per cent. By way of comparison, the handle of a stainless steel meat knife retailing at 12¢ contained more than 100 times as much silver as did this large box.

In the absence of adequate standards or laws this article may be sold as "silver-plated." The consumer chemist, however, feels that specifications should be created for the purpose of protecting the consumer.

Unreliability of a Manufacturer's Markings

We had occasion to examine a number of spectacle frames. They were gold filled—that is, they were made of base metal plated with gold. They were stamped "1/10-12K" which means that the gold plate was composed of 12-karat gold and that it constituted 1/10 of the frame by weight. These frames were not assayed as the term is commonly used. They were analyzed by the wet method. Check tests were run, and the results revealed the fact that the appearance of the 1/10-12K mark on the article was not always an indication of its true composition.

Much water went over the dam before the investigation was completed; but the gold-plate manufacturer finally admitted that the thickness of gold in his product varied more than he had bargained for, and the manufacturer of gold frames confessed that he had been trying just to get by with his merchandise. Chapter VIII of the U. S. Code Annotated was apparently unknown to these gentlemen or else, as one of them remarked, "It does not include us." Finally, however, they promised to produce merchandise which would conform to the law.

A marvelous liniment was submitted for test. It was described as being the latest scientific and most astonishing discovery, and was recommended for anything from carbuncles to pneumonia. All you had to do was to moisten a piece of chamois with this wonderful liniment, apply the chamois to the body, cover it over with newspaper, and then take a laxative.

Upon examining this $5.00 can of liniment it was found to be composed of impure chloroform, too impure to be used by surgeons and worth, I should judge, about two cents a can.

Then there is the study of the wonderful reducing bath salts at $2.00 a package. All you had to do was to fill the tub with hot water, empty the two dollars' worth into the tub, stir well and step into the milk bath. A mysterious tablet was supplied. Instructions required that you place it under your back. Many bubbles would then trickle up through the water, presumably tickling your spine for about fifteen minutes. When no more bubbles appeared, it was time to get out of the bath. Three baths a week were recommended.

The proprietors of this product, however, did not supply a very much needed precaution. For, if someone should enter the bathroom while you were taking this bath and accidentally or otherwise should drop a little iodine into the tub, the iodine would combine with the starch and the milk would turn into ink. This product was composed principally of starch with a little washing soda and borax. A few pennies' worth of epsom salt or common salt would have been just as effective and certainly much less expensive.

Hiding behind Reputable Firms

A drink marked "Sparkling Grape, a natural product, artificially colored," was found to contain an excessive amount of methyl anthranilate. The manufacturer, upon being notified that it was taken off sale, submitted quite an amount of correspondence to refute our findings. Among his papers was a letter from a certain health officer saying that he believed the product was unadulterated because the New England

manufacturer of the grape concentrate had assured him that it was pure. Another piece of correspondence consisted of a letter from the manufacturer of the concentrate. This latter person claimed his product was pure for the reason that it was made of grape juice fortified by a highly concentrated extract of grape purchased from a reliable essential oil house in New York.

I procured the concentrated extract from the New York company and upon examination found nothing therein of a synthetic nature even though it was eight times stronger than the natural grape. Apparently the New England manufacturer was using the name of the New York house as a subterfuge to cover his own violation of the law—for while he may have used small quantities of the true concentrate, analysis disclosed enormous quantities of synthetic esters. This proves the need for testing, even though the names of reputable people are used in connection with claims concerning purity or efficacy.

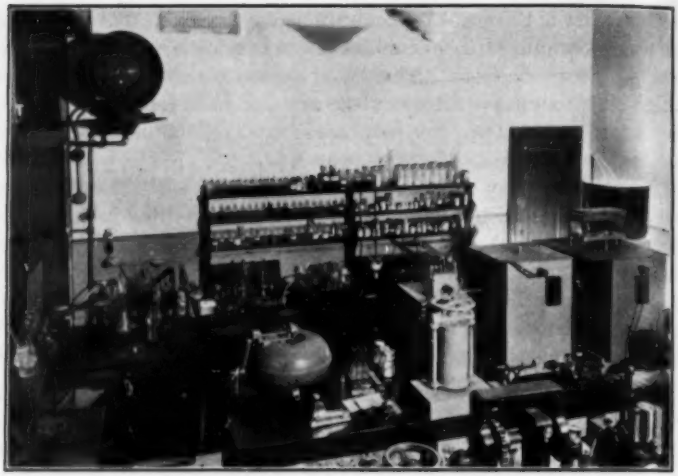
Multiple Defects

A certain liquid was submitted for test. The vendor claimed it was a most efficient moth-proofing compound and far superior to any of the others on the market. A report of an independent laboratory was also submitted. This report made mention of the use of a total of two hundred moth larvae over a period of two and one-half years. Material treated with the moth-proofing compound, and untreated material were served to the larvae, but only the untreated material was attacked. The following statement appeared in the report:

"The above test was conducted using a Petri dish with good ventilation. The length of time during which the material was exposed to the action of live active moth larvae should be equal to many years under normal condition."

Quite sufficient, one might say to warrant the sale of this product. But we wanted to see for ourselves. We could not afford to wait two and a half years nor did we have to, for within two weeks two moth larvae were able to accomplish what "200 live active moth larvae" failed to do during a period of two and a half years.

The story does not end here, for the vendor claimed that his product contained a secret ingredient. We were not particularly interested in ascertaining what it was, but we did want to find out whether the compound would stain garments. Physical tests were undertaken, during the course of which an organic crystalline body was removed. It responded to certain well-known alkaloidal reactions for narcotine, an alkaloid of opium. Its melting point was found to be 176° C. Was the



ANOTHER PART OF THE MACY CHEMICAL LABORATORIES

Harrison Narcotic Act being violated? Apparently so, for no registry number appeared on the container. We did not buy the product.

Customers Appreciate the Truth

The consumer research chemist believes that standards should be created for all materials. These should include minimum specifications. They should embrace tests, the results of which will convey to the ultimate consumer the desired information.

Many may claim that such a procedure will build up sales resistance because of consumer doubt. I must emphatically state, however, that I cannot agree, because we have experimented and we are in a position to know.

Some years ago we notified our public that we did not guarantee the wearing qualities of transparent velvets. Ladies who wanted them for their style value continued to purchase. Ladies who considered the life of the garment more important than style bought other merchandise. The sale of transparent velvets, however, increased by leaps and bounds, and the complaints dropped to nil.

Later on we notified our public of the percentage of wool in our men's underwear. We did not hesitate to say that some of our underwear contained 10% of wool. We knew as a result of chemical analysis, that

garments sold by stores making claims of as high as 50% wool, contained as low as 4%.

Signs in the underwear department proclaimed the wool content of our garments. Our customers came, saw, believed, and purchased in ever-increasing quantities. Now the percentage of wool in all union suits appears on a label sewn on to each garment.

Customers were returning children's cotton Roman striped hose because of staining by the dyestuffs. We posted signs in the department and issued pamphlets with each pair sold, reading "Roman striped hose occasionally become slightly stained during the washing process because of excess dye. Thorough rinsing will lessen staining." The sales continued, the complaints ceased. Customers no longer purchased a cat-in-the-bag.

These are but a few of countless experiences. They have been cited to explain the necessity for constant watchfulness over merchandise.

The consumer research chemist is also responsible for the proper choice of descriptive terminology as related to merchandise. He believes it necessary that the vendor, retailer, and public all speak the same language. One of the ways in which this is brought about is by the issuance of bulletins in which certain terms are clarified. An example of this is given in our M. B. S. Bulletin No. 33, which was distributed among all department managers. I will quote from this bulletin:

RAINCOATS

The question of the performance, descriptive terms, and adjustments applying to raincoats has again been raised.

Three terms descriptive of the performance of raincoats are in general use. They are "waterproof," "rainproof," and "showerproof."

"Rain" is a downfall of water resulting from condensation of vapor in the atmosphere; it varies in amount from dew to cloudburst.

"Shower" is a fall of rain of short duration. A shower may consist of a slight sprinkling of small drops or it may approach a cloudburst in severity.

"Waterproof" and "rainproof" are considered as being synonymous, for they have essentially the same meaning.

The term "waterproof" may be applied only to material which has been made impervious to water, or to a garment constructed of waterproof material pieced together in such a manner that the garment as a whole is impervious to water. Only rubberized and oilskin garments come in the "waterproof" class.

Garments treated with "waterproofing" compounds for the purpose of shedding water are classified as "showerproof" providing they resist a hydrostatic pressure of 17 centimeters.

> The public believes that all rubberized garments are "waterproof." This belief is founded upon the fact that rubber is applied to a fabric solely for its "waterproof" properties.
>
> The selling of a rubberized garment as a "waterproof" or "rainproof" garment is considered as being misleading, unless the garment as a whole is "waterproof." To accomplish this, the seams must be cemented and taped.
>
> Rubberized garments which are not "waterproof" ought not be sold, for just as much protection plus comfort may be obtained from garments which have been treated by the "Cravenette" or similar process.

Another means is by the circularization among vendors of bulletins in which we define certain terms and describe exactly what those terms signify.

The "Circular to Vendors" describes our washability requirements, states how tests are conducted, defines certain terms, and enumerates the results to be expected when the directions for test are carried out. Unless otherwise specified the technique is that recommended by the American Association of Textile Chemists and Colorists.

Either the manufacturer or the store must then label the merchandise as to method of washability.

Specimen tags are also used to describe the behavior of merchandise. They carry such information as the following:

> METHOD C-5
>
> CAREFUL WASHING DIRECTIONS:
>
> Dissolve thoroughly "neutral" soap, such as Lily White Flakes, Ivory Flakes, Lux, or Fab in hot water and add cold water until wrist temperature (98.6° F.) is reached. Use enough soap to produce rich suds. Wash article as quickly as possible without rubbing or twisting. Rinse thoroughly in clear water at wrist temperature. DO NOT DRY DIRECTLY IN SUN. While still damp, stretch to original shape, and press on wrong side with warm iron.

Each day all advertising copy is forwarded to our Bureau of Standards, where it is carefully reviewed for statements of questionable nature. Perhaps a few of these statements and corrections will prove of interest. I will quote from two columns.

Part of Copy Questioned	Change Made in Copy
"We know they're color-fast because we tested them."	"Color-fast" changed to "washable."
"3-Piece knitted kid angora suit."	Changed to read: "3-Piece knitted suit of angora and wool.

	The skirt and jacket are all mohair. The blouse is of wool trimmed with rabbit hair."
"Alpaca-lined coats."	Changed to: "Cotton- and alpaca-lined coats."
"Linen violets."	"Linen" deleted.
"Pure dye silk blouse."	"Pure dye" deleted.
"Silk-lined fur felt hats."	"Silk-lined" deleted; "satin" substituted.

Here are a few examples I have noted in current advertising where failure to employ a consumer research chemist has resulted in the sale of improperly described merchandise.

1. A comfortable of "white lamb's wool, specially selected superior wool" upon analysis was found to contain but 14% of lamb's wool.
2. A "taffeta seam binding—all silk" was made of pure dye silk ends and nitrate rayon picks.
3. A capeskin coat the description of which read in part as follows: "Because every one is made to rigid specifications. . . all wool linings for warmth and wear." The body lining was found to contain almost 52% of cotton and viscose rayon, while the sleeve linings were made of cotton cloth.
4. A "Gladstone bag of sole leather. . . made of solid leather . . .used on the most expensive imported luggage" upon examination was found to consist of cardboard backed shoulder and/or flank cowhide.

But even though what I have related may appear sufficient, the work of the consumer research chemist and engineer goes even further; for, urged on by the need for more satisfactory merchandise, he confers with vendors, explains the deficiencies of their products, and suggests means of remedying them. As a result of one such suggestion, a seam binding manufacturer later stated that his sales had increased over 100%.

Business is more highly competitive today than perhaps at any time within our memory. That situation inevitably breeds lowered standards of quality—pinching a little here, lopping off a little there.

The consumer research chemist is not alone the safeguard of the store of which he is a part. He is the safeguard of the public—an investment in safety—a necessity, if you please, in the present retail situation.

BY-PRODUCTS

System

ANOTHER of our heresies concerns that most sacrosanct institution, the system. It matters little upon what type of human activity system is imposed, it speedily becomes an untouchable, unchangeable, uncontrollable abstraction that enslaves the minds and actions of all subject to it.

The principal excuse for system is said to be efficiency, but a blunt critic might refer it to laziness and timidity. At any rate a system is a coördinated group of methods whereby all manner of agenda are handled automatically with a minimum of mental effort. Why we should be so eager to conserve brain-work does not appear. It can hardly be maintained that we are extravagant with the available supply.

The difficulty with a system resides in its automatism; it eventually gets out of hand, takes control and mocks the effects of anyone to reduce it to subservience. It becomes a master instead of remaining a servant; it straddles our shoulders like Sinbad's "Old Man of the Sea" impedes our actions, baffles our plans, and in the end tends to submerge us in despair. Systematization is sociological entropy.

We suppose it will be fruitless to attack so thoroughly established an incubus as system. And perhaps it ill-becomes a constitutional conservative, even though reflective, to do so. But it seems to us that the most ominous threat to our civilization and one that may result in its destruction lies in over-systematizing. We wonder if that complete systematization of human functions known as communism would not find itself sterilized by its own creation. Not that our civilization is so perfect as to merit indefinite preservation, but at least it has inherent powers for improvement. All progress is not paralyzed by Chinese walls of rules, regulations, and restrictions.

We agree that some systems are modified and others become obsolete and are discarded. But the modifying influences originate in the area of freedom outside the system. We wonder where they will originate when all of the free areas have been incorporated in the system. Will our human society then become a duplicate of that biological paradise, the colony of hymenoptera, which hasn't had a new idea since the Eocene, at least?

Half of the existing human misery is due to system; the other half is due to lack of it!

They Say:

"IF the atom is not an electrical machine but a creature of electrical activity, as organisms are creatures of chemical activity, to dissect it is not to know *it* better, and the knowledge of its structure so acquired may be only misleading to the investigator who misconceives its real nature. The physiologist who makes the organism a physico-chemical machine, in going beyond the simple fact of the organism, goes wrong. There are things we just have to accept. And if the structure and functioning of atoms were known as exhaustively as human anatomy, physiology, and psychology, the atom would still be as unexplained and inexplicable as man." J. C. McKERROW, *Novius Organum*

Carbonium Gnitrate says Mr. Rockefeller's practice of giving away dimes is an application of the quantum theory to benevolence. The value diminishes as the frequency increases.

Stupidity

"THE country is still safe," the Barrister announced one morning recently. "The stupid still sit in the seats of the mighty!"

"Your alliterative allegation allures, as the headline writer might say," we responded. "But why bring that up? Adverse ruling?"

"Not at all. I have just been reflecting that we as a nation suffer from too much acuteness. The average American is too brilliant. Much too brilliant."

"Our understanding is that it has been settled the average American is a moron," we objected.

"That's an idea of the stupid ones," said the Barrister calmly. "Stupid people are always suspicious of cleverness. It strikes them as childish mental instability. No clever person, they reason, can stay long enough in one position to accomplish substantial results. Butterflies may be beautiful but they don't produce coral reefs."

"Neither do moonbeams," we retorted, "but we could dispense with coral reefs easier than with butterflies and moonbeams."

"Of course, ornament is desirable, even necessary, if you insist, but one must have something solid and substantial to support the ornamentation."

"And the stupid furnish the base for adornment by clever persons?"

"Not only the base but the energy and the permanence," the Barrister snorted. "The Greek civilization crumpled because it focused all its energies upon brilliance. It didn't at the same time foster a substrate of obtuse solidity. It dissipated its forces in empty form and never recognized the importance of substance."

There was something about this that we felt was sophistry so we countered with the argument that the Romans were hardly brilliant as a people, seem to have had a high proportion of stupidity, and yet Rome fell.

"But only after Rome had been thoroughly Hellenized."

The Barrister looked triumphant. But we ruined his complacency by asking,

"Then the Greeks were able to make the stupid Romans clever?"

We thought the Barrister was silenced but he was merely revolving that idea in his head. Finally he said, "Nothing can turn stupidity into brilliance, not even sparkling Burgundy."

We cried "Foul!" but he winked as Bacchus may have winked at Apollo, and continued, "The imported Greek culture affected the ruling class of Romans that could not digest it and where it remained a spurious thing, an impediment to rugged Roman thought. Had the rulers continued in the old tradition of the Tiber—that is, stolid and determined persistence—the Greek ideals might have saturated the populace but Rome would still be Rome! Consider that the Romans would never have thought of the Trojan horse device. They would have taken Troy by regular uninspired siege procedure."

"However, there were the geese of the Capitol," we suggested.

"Geese," he repeated. "An appropriate symbol for Roman intelligence!"

We thought of the glorious Roman eagles borne on brazen standards before the thundering legions. Somehow geese didn't fit into the picture.

"The races of Northern Europe," resumed the Barrister, "from the Huns, Goths, and Vandals to the moderns have owed their success to their stupidity. The English have spread over the world by virtue of that quality."

"We can understand," we interrupted, "that a thousand stolid persons are required to carry into effectiveness the ideas of one creative mind. But if your theory is correct, why didn't the dinosaurs inherit the earth?"

"They ate too much," he flung back, reaching for his hat. And there the matter rests.

—*The Autocratic Chemist*

The Builder of a Profession

By Florence E. Wall

The story of Frederick E. Breithut, retiring president of The American Institute of Chemists. A chemist who has used his executive ability in behalf of his fellow-scientists.

"THE trouble with the scientists is that they pursue their own line of work and seem to forget everybody else. They think that all work outside of science is baby work. They go into their special field and ignore the rest of the world. They believe in science for science's sake, not for man's sake. I don't believe in science for science's sake, art for art's sake, or literature for literature's sake, but I believe in all of these things for humanity's sake."

Surely it was the poor light that made the paper look so yellow! Surely this was what we had heard at The Chemists' Club not so long ago! The sentiment, perhaps, but not just this expression of it, because the newspaper actually was yellow with age. Its date was August 15, 1903, and the lines quoted constitute the first paragraph of an article by one Frederick Breithut, cub-writer of scientific editorials in *The New York Evening Journal.*

So, in his beliefs of thirty years ago, did this man lay the foundation of a career that has been consistently directed toward the humanizing of science, specifically chemistry, both in interpreting its benefits to the public and in arousing appreciation of the personal side of those who practice it professionally. But only now, at the close of his four years as president of The American Institute of Chemists, has he granted the often-repeated request to publish the entire story of the very full years that preceded—years of constructive work that logically led him

to the head of the only organization devoted exclusively to the interests of chemists as persons, rather than to chemistry as a science.

FREDERICK ERNEST BREITHUT is one of those comparatively rare individuals, a native New Yorker, for he was born in that city on August 15, 1880. He was educated in the city schools and received his degree of Bachelor of Science from the College of the City of New York in 1900. Inspired by a real love of teaching, he set out on a strenuous career, teaching days, nights, and summers for the first few years.

It was during those early days out of college that the scientific editorials appeared in the *Journal;* in fact, their author was exactly twenty-three years old on the day when the quoted article was printed. He recounts with high spirit the story of the important lunch date with Arthur Brisbane at which the proposed articles were discussed, and still chuckles over some of the pithy comments and bits of advice that were tossed off by the veteran newspaper man as he sorted out the possibles and impossibles.

In 1903, our energetic teacher transferred his activities to the College of the City of New York, where he taught inorganic chemistry and qualitative and quantitative analysis for several years. He had, meanwhile, enrolled for graduate work at New York University and received his degree as Doctor of Science in 1909. His thesis, *A New Method of Measuring the Partial Vapor Pressures of Binary Mixtures,* was immediately translated and reprinted in Germany.

Dr. Breithut was the first student to work for a doctor's degree under the direction of Arthur B. Lamb, now at Harvard, and the two became great friends. They were nearly of an age, with many interests in common, and found much genuine enjoyment in discussions of philosophical, metaphysical, and social questions. Dr. Frederick Zerban also remembers many such occasions, and was wondering not so long ago what has become of all the members of the "Rationalist Club," headed in those days by Paul Radin, the ethnologist, in which Dr. Breithut and he, and Robert Lowie, the anthropologist, and others, all met and went off on tangents.

While he was teaching at City College, Dr. Breithut had inaugurated courses in municipal chemistry—applied analytical work in cooperation with the practical needs of the city laboratory. To further this cooperation, he made an intensive survey and prepared a valuable monograph on *Training for Municipal Service* (1915) in which he presented the recommendation that the City College should offer courses for the

proper training of those who wish to enter public service, and offered the full cooperation of the College for such training in Municipal Civil Service.

This publication was followed by others, studies of individual vocations, *The Engineer in Public Service*, and *The Chemist in Public Service;* and data were collected for similar considerations of the physician and the lawyer. No study of these little volumes can give any conception of the amount of work that must have gone into their preparation, but their practical results soon became evident in Dr. Breithut's strengthening stand on the inter-relationship and mutual benefits of chemistry and economics.

ADEQUATE recognition of professional employees in the city service might have come much earlier if Dr. Breithut's activities in this field of research had not been interrupted by the war. He was almost at once appointed chairman of the Bureau of Conservation of the Federal Food Board in New York, but soon resigned this post to become Chief of Personnel with a major's commission in the Chemical Warfare Service, directly under Major General William L. Sibert.

It was not an easy task—this weaving together of scattered threads, running through numerous government departments, into one solid fabric that would serve a definite purpose and fill a serious want in the general organization of the army. The Personnel Division of the Chemical Warfare Service was charged with all the responsibilities of the Personnel Division of all the other Army staff corps, as well as its two principal functions: to assume control of all chemists entering the Army, and to take a census of all chemists, military and civilian, throughout the entire country.

The fear had frequently been expressed that the United States would repeat the disastrous error that both England and France had made in sending their chemists into the firing lines instead of detailing them to useful technical work elsewhere. This was happily avoided here by keeping the proved chemists engaged wherever possible in chemical work, either with the American Expeditionary Forces in France or at home. Within all reasonable limits permitted by the serious discrepancy between the demands of the Army and the number of chemists actually available through the draft, the chemical man-power of the country was conserved as efficiently as possible. Hasty misfits were re-assigned as soon as possible, and measures had just been taken to assure the placing of every man according to his best abilities when the armistice was signed. Colonel Marston Bogert, who served in an advisory capacity

in this adapting and adjusting, Charles H. Herty, Allen Rogers, and others who were close to Major Breithut during this trying period, pay high tribute to the efficient manner in which he conducted his difficult office.

THE WAR over, Major Breithut was designated by Major General Sibert as Chairman of the Chemicals Division of the War Industries Board. As a part of the general *History of Prices during the War*, he prepared an exhaustive study of *Prices of Chemicals* (from 1914 to 1919), which involved a survey of the chemical industry as a whole and the detailed consideration of each class of products within the chemicals group. When this work was completed, he was appointed Chief of the Division of Salvage and Sales of the Chemical Warfare Service, to direct the utilization, conservation or other disposal of chemical products that had been developed by the Service during the war period.

Late in 1919, he returned to civilian life and for a short time served as the chemical director of the Foundation Oven Corporation. This was followed by a year and a half with the Calco Chemical Company, as assistant to the president, R. C. Jeffcott. The always latent urge to public service again brought Dr. Breithut into association with Dr. Herty in the latter's efforts to establish the protection and maintenance of an independent chemical industry in this country, and he aided actively in the work for legislation until it was finally assured in 1921. It was during this period that he published his famous editorial on *Disarmament and Dyes*, which received wide, favorable comment and was frequently reprinted.[1]

For a born teacher like Dr. Breithut, it was only natural that he should sooner or later want to seek out his first love once more. Immeasurably enriched by his accumulated experiences, he returned to City College, where he soon inaugurated the first courses that were ever given in any institution on *Chemical Economics* and *Chemistry for Salesmen*. The latter was a decided innovation—one that could have had its conception only in the fertile brain of one keenly interested in chemistry and economics and the human relations in both subjects.

After all, why not? If the new chemical industries were to survive, someone must be found who could sell their products intelligently. Until the chemists who made the products would be both willing and able to slide off their high stools and go out and sell what they made, it seemed simpler and more logical to bring in those who presumably already knew whatever there is of the science of selling, and sketch in a background of chemical knowledge for them.

[1] *The* CHEMIST, February, 1930.

But the peace of the academic halls was soon interrupted by a call to the president of City College from the then Secretary of Commerce, Herbert Hoover, who was in urgent need of "a well-trained chemist with a commercial background, to represent the Department in Germany." The Secretary felt that the situation required "an exceptional man of high technical standing and especially of some judgment and integrity;" also, that "Professor F. E. Breithut...has these qualifications and enjoys, furthermore, the complete confidence of the manufacturers' organizations which are most directly concerned." He wondered, therefore, "whether it would be possible to give him an extended leave of absence, effective immediately, in order that he might assist this Department and the chemical industry of the country in this emergency..."

Dr. Breithut answered the call, of course, and spent a year in Europe as the first American Chemical Trade Commissioner. He traveled extensively during this period, submitting reports (published as *Trade Information Bulletins*) on the status of the coal-tar chemical industry in Germany, France, Great Britain, and Italy. One reads these reports with the comforting realization that they were prepared by someone who knew what he was seeking, knew how to appraise it, and knew how to present his observations so that they would be of the maximum value to all who consulted them.

And such is the general opinion of all who have ever commissioned Dr. Breithut to make a study or survey of anything, and submit a report on it. He has a keen mind, with a remarkable gift of orderly thinking and a rare talent for organization. Anyone who has ever assigned a project, great or small, to Dr. Breithut, has known that the program would be well planned in advance and completed efficiently in every detail.

After his return to the United States in 1924, Dr. Breithut went once more to City College, where he remained as associate professor of chemistry until Brooklyn College was established in 1926, and he was transferred to the new branch as head of the department of chemistry. Of the splendid growth of Brooklyn College, especially of its chemistry department under Dr. Breithut's keen eye and able hand, more is told in another article in this issue. No mention of it can be made without reference to the important part that has been contributed by the forceful personality, as well as by the broad knowledge and experience of this head of the department of chemistry.

IT MUST have been the returning consciousness of his early efforts to better the condition of employees in public service that led Dr.

Breithut to take an interest in The American Institute of Chemists. He had long been convinced that chemistry was over-organized technically and under-organized—in fact, completely *un*organized—professionally. He saw in the Institute a means of interesting chemists with adequate education and training in the idea of fostering group solidarity and eventually obtaining recognition as professional persons, as well defined and understood as are the physicians, the lawyers, and the engineers.

After one season of relatively quiet observance of what the Institute was trying to be and do, Dr. Breithut was elected chairman of the New York Chapter, and immediately began to make his constructive influence felt. He promptly abolished any semblance of technical addresses at meetings and substituted discussions on ethics, on contracts, on licensing, and on just what other means should be employed to establish professional standing for chemists and improve their economic status. During those days he first voiced the pithy thought that has since become practically the slogan of the A. I. C.: "Other chemical organizations try to make chemists out of human beings; the American Institute of Chemists tries to make human beings out of chemists."

It was with this thought, strengthened almost to a fixation, that Dr. Breithut progressed from the chairmanship of the New York Chapter to the presidency of the Institute in 1928. In his inaugural address at Washington, he stated openly that it was time for the Institute to emerge from its dormant state of apologetic inanition, establish a definite policy, direct its course, and actually start out to get somewhere; and the quiet forcefulness of his closing words, "Gentlemen, we *are* going on!" must have served as a brisk injection of confidence and enthusiasm to all who heard him.

He knew well the opposition to the Institute that had existed since its establishment, five years before, but felt that this opposition was due to a lack of understanding of its true purpose, so he dedicated himself to a vast educational campaign. To the public, he proposed to define a *chemist*, so that lay persons who had technical work to be done could have some standard of education, training, and efficiency by which to measure their choice, and thus protect themselves against a waste of time and money. To the schools, he proposed to show the vital need for practical education of future chemists, so that their product would be better fitted to meet the requirements of industry—not only in the knowledge of chemistry, but also in the knowledge of broader, cultural subjects that build background, and of the economics, the psychology, and the basic business training that build future executives. Finally,

he proposed to convince the chemists themselves that their strength lies in professional organization and solidarity, in rigid standards and rules of conduct among themselves, and above all, in coming out of their laboratories and out of themselves, to become articulate participants in civic affairs and in human relationships generally.

ALWAYS with his thoughts directed toward public education, dignified public relations, and internal self-respect, the first thing to which Dr. Breithut gave his undivided support was the publication of a printed bulletin for the Institute. The multigraphed sheets that had served as the only means of inter-communication among the members, produced by the sacrifice of inestimable time and personal effort on the part of Calm Hoke, were replaced by a printed sheet—at first only a four-page leaflet—in which the members at large were first cordially invited, then politely urged, then passionately exhorted to express themselves. From the mere word *Bulletin*, the name was soon changed to *The* CHEMIST, to designate more accurately its true purpose as the one magazine in the country that is about, by, for, to, and with *chemists* and their professional problems.

Its growth from four pages to ninety-six pages in four years shows that Dr. Breithut's vision has materialized into something tangible that justifies both his hopes and the generous financial assistance of the Chemical Foundation that made it possible.

The next matter of importance to which the new president gave his serious consideration was that of the awarding of the Institute Medal. This had been established in 1925 "for noteworthy and outstanding service to the science of chemistry or the profession of chemist in America." The first two awards were to chemists for their scientific achievements; as "just another chemistry medal" it did no particular good to the recipients, nor to anyone else. Dr. Breithut made another of his competent surveys and soon found that in all the medal awards that are made from year to year, no one seemed to give a thought to "the powers behind," those generous benefactors who, though outside both the science and profession of chemistry, have often supplied the sole means of making those scientific achievements possible.

So, with what Dr. L. V. Redman considers "a power of discrimination amounting to vision" Dr. Breithut has either inspired or guided the choice of recipients of the Institute medal. First, to Mr. and Mrs. Francis Patrick Garvan, for it is difficult to dissociate these two who have acted so completely as one in their unselfish work for chemistry and chemists—by establishing the Chemical Foundation, by financing

American chemical publications, by instilling an appreciation of chemistry and chemical education into the public through school contests and home study courses, and by their almost boundless generosity in financing medical and chemical research to prosecute the indefatigable war against disease.

Other awards to those outside the science and profession of chemistry have been made to the late George Eastman, for establishing a research laboratory for the manufacture of badly needed fine synthetic organic chemicals and to Andrew W. and Richard B. Mellon, for establishing Mellon Institute of Industrial Research at Pittsburgh. But the latest award brings the medal back into the fold, for it goes this year to Dr. Charles Holmes Herty, the chemist who is so infinitely "much more than a chemist" that he can easily be declared the one man who has done the most for *both* the science of chemistry *and* the profession of chemist in America.

ONE of the outstanding accomplishments of President Breithut's period in office was the success of his efforts to secure both professional recognition and a substantial increase in the pay of the municipal service chemists in New York. For years these chemists had suffered through their improper classification and their inadequate compensation, but because of their lack of organization nothing had ever been done about it. The successful battle for readjusted status and compensation which had been won by the engineers gave the chemists heart to band themselves together and make a concerted effort. An appeal to the Institute brought Dr. Breithut in person, to talk the discouraged men into some sort of encouragement and enthusiasm, and from then on, he aided them tirelessly in their plans and efforts for the economic readjustment that was their due. It took months of time and patience and eloquence, but these were cheerfully given until the plea to the Board of Estimate and Apportionment, strongly backed by several organizations friendly to the chemists' worthy cause, was finally answered by the requested increases in salary and a re-classification of the chemists in the city service.

These are only the major accomplishments of two terms as president of the Institute—for Dr. Breithut was unanimously re-elected in 1930. But in every possible way he has always consistently served its best interests. Seeing the value of training young chemists up to the idea of professional solidarity and recognition, he has been a strong advocate of student chapters in the various universities, and expects soon to have the pleasure of inaugurating the first official one in his own Brooklyn College.

Everywhere he has gone, he has talked about the Institute, its aims and objectives, and its definite place in the professional world. Many of its now valued members had gone along serenely indifferent—if not actually opposed—to the idea until Dr. Breithut's sincerity and his true crusader's spirit made them see it in a new light.

AFTER all, so much of the success of any enterprise depends on the spirit and personality of those who undertake it. Dr. Breithut has brought to the Institute all the treasures of a broad cultural background, of widely diversified experience gained in teaching, industry, and travel, and the practical benefits of a lifetime of study and good reading—voracious reading of useful books on economics and general science. He has traveled extensively in this country and Europe, has a fluent knowledge of French and German, and with his easy grace of adaptability, can make himself feel quite at home in any surroundings, with any kind of people. He has a keen appreciation of values—human and other kinds—a wholesome admiration for whatever is genuine, and a cordial detestation of everything that savors of sham and superficiality.

What everyone always likes about Dr. Breithut are his *bonhomie*, his cordiality, his genuine, good-hearted friendliness, and his incomparable gifts as a story-teller. The delightful manner with which he can dramatize the telling of some amusing experience, and the boyish laughter which never fails to infect listeners with his own huge enjoyment of a joke—especially on himself—would warm any misanthrope's heart. It is a rare tribute to any *raconteur* when others decline to steal his thunder; but it is quite common to hear some well-entertained person say, "Oh, ask Breithut to tell you; I'd only spoil it!"

Besides reading and story-telling, another of Dr. Breithut's pet occupations is playing the piano. A surprising number of persons know nothing whatever of this talent, a hidden facet, more or less obscured by the shining ones shown to the world, but it has always been there. His father was musical; and Dr. Breithut often tells of his own sacrifices while he was going to school and college, saving all his money so that he could go the opera or to concerts in his rare spare time. He was a great Wagner enthusiast, and in his early days at City College, he and Dr. Zerban often presented duet programs of selections from the operas and symphonies.

But let William A. Hamor tell something about this:

> I think that nature intended Fred Breithut for a musician—a great pianist. I believe, however, that his friendly association with Dr.

> L. H. Friedburg, just before and following his undergraduate work at C. C. N. Y., made him decide to become a chemist. Music has always pleased and thrilled Fred; but Dr. Friedburg's formal and informal discourses compelled his interest in chemistry. If this fact is surprising, considering his inherited and acquired musical art, it should be recalled that chemistry and music are strangely correlated, and that it is not difficult to find in chemical science, even without assiduous effort, that proportion of romanticism necessary for well-being.
>
> Someone has said that an orator is one who dominates those who hear him, convinces their reason, and controls their judgment. If that is so, then Dr. Friedburg was an outstanding chemical orator—a worthy successor to Dr. R. Ogden Doremus. Certain it is that his inspiring personality induced a number of his students to choose chemistry for their profession; and Dr. Breithut is his most prominent contribution—a successful teacher, laboratory director, and professional leader.
>
> A teacher who is musical has a beneficial advantage over his pedagogic colleagues. Music enables him to express his feelings at home, without language; and if he is a pianist, like Fred, he can rest his voice as well as his mind. . . .

No one seems ever to have given it any thought, but the outstanding figure in the history of chemistry who receives honorable mention for his ability and accomplishments in music was considered the most cultured man of his day in all Europe—Herman Boerhaave, the distinguished chemist and physician of Leyden, who made a special study of the problem of affinities and seemed to settle it for all time that "opposites attract."

It is not that Dr. Breithut would make musicians of all his chemistry students, but he encourages music in the social activities of the college chemistry club. And he still loves to play the piano and to go to concerts and the opera.

He is essentially an outdoor man, and spends most of his free time at golf, either in New York or at his summer home at Nantucket. He belongs to the Seawane Golf Club at Hewlett, Long Island, and to the Nantucket Yacht Club.

Dr. Breithut's only son, Richard C., recently graduated from Harvard, is the son of his first wife, Edith Commander, to whom he was married in 1904. His second wife is the former Florence Hastings, of St. Joseph, Missouri, whom he met and married in Paris, in 1924, while he was serving as American Chemical Trade Commissioner.

BESIDES the Institute, Dr. Breithut is a member of the American Chemical Society, the Chemistry Teachers' Club, and The Chemists' Club. He takes an active interest in every good cause for the pro-

fessional betterment of his fellow chemists, and at any public meeting can always be depended on to express an opinion of value, or offer constructive suggestions.

In placing the final period at the end of this chapter in the busy life of this outstanding professional chemist who has devoted so many years to unselfish humanitarian work for his colleagues, it seems only fitting to quote in its entirety this paragraph of a letter from Dr. M. L. Crossley, past president of the American Institute of Chemists:

"It seems to me that the Institute is fortunate to have had Dr. Breithut as its president for the past four years. He has succeeded in securing the foundation of the organization and has made it possible for the Institute to serve the profession through the medium of *The* CHEMIST. His unselfish devotion to the task of securing professional solidarity for the chemist, and the emphasis which he has placed on making human beings out of chemists have done much to bring about a better realization by the chemist of the part which he plays in the social and economic progress of the world. The entire profession owes a debt of gratitude to Dr. Breithut for his unselfish devotion to the work of the Institute, and especially to the advancement of the economic status of the chemical profession."

An Appreciation

ON MAY SEVENTH, Dr. Breithut retires as president of The American Institute of Chemists. It is no more than a fitting tribute to his untiring efforts and zeal that the Association of Municipal Chemists of the City of New York pay its respects on this occasion to one who, as president of the A. I. C., labored so ardently for a cause sponsored by our Association.

Dr. Breithut's association with the cause of the Municipal chemists dates back to December, 1928. Our organization, composed of all the chemists employed by the City of New York, was trying to find ways and means of securing the professional recognition that was rightfully theirs. An appeal was made to many organizations to accomplish our aims, among them the A. I. C. The response was most hearty, and upon the advice of Dr. Breithut, its president, a statistical study was made of the New York City chemists and allied professions. The data thus obtained were included in a "proposed schedule of grades and salaries" and placed before the proper city authorities. On the advice of Dr. Breithut, further appeals were made to civic and professional groups, to strengthen the appeal made by the A. I. C.

Through the untiring efforts of Dr. Breithut, who was our constant adviser at that time, appearing personally before various Commissioners and Board meetings, arguing, pleading, and persuading, an appropriation was granted by the city for the adjustment of salaries of Municipal chemists.

But Dr. Breithut's task was not complete. The Municipal chemists desired a proper civil service classification and grading similar to that given to other professional groups employed by the city. In this undertaking, Dr. Breithut appeared personally before the Municipal Civil Service Commission and pleaded the cause of the Municipal chemists. After much delay the Civil Service Commission made a comprehensive study of the situation, and went on record as recommending a schedule of grades and salaries for chemists, in agreement with that proposed by us and approved by the A. I. C.

It would be unreasonable to expect that all grievances held by the city chemists could be righted at once. After much delay and with constant demands by Dr. Breithut, a partial distribution was made of the appropriation by the city to the chemists. Although no classification was officially adopted for chemists, it is hoped that the one agreed upon by the united efforts of all concerned will ultimately be adopted. In this

undertaking, it was an inspiration to all of us to have found Dr. Breithut always ready, willing to sacrifice his time and give his efforts in fighting a just cause sponsored by members of his profession. He was self-sacrificing in our behalf; and his zeal and integrity were an example to all of us in personal unselfishness, professional solidarity, and love for his fellow men.

ASSOCIATION OF MUNICIPAL CHEMISTS OF THE
CITY OF NEW YORK,
FRANK H. BIELE, *Secretary*

New York Chapter

IT IS just four years since the New York Chapter gave President Breithut to the Institute. For the past two of those years the writer, as representative of the New York Chapter of the National Council, has had unusual opportunities to see President Breithut at work.

In view of the results of President Breithut's two administrations, no testimonial is needed. All of us, who hold the aims and objects of the American Institute of Chemists near to our hearts have had ample cause to rejoice in the solid achievements of the Institute; but only those of us who have worked closely with President Breithut can know how much of this advance has been planned in his fertile brain and completed by his efforts.

KARL M. HERSTEIN

Pennsylvania Chapter

WE OF the Pennsylvania Chapter are glad to acknowledge our debt to Dr. Breithut for his four years' service as president of the Institute. He has been a hard worker and a strong leader.

Outstanding in his constructive work has been his success in enlisting aid and interest in the Institute. We appreciate deeply the time and effort he has put into his office and we hope that he will continue to be active in Institute affairs.

FRANKLIN D. JONES, *Chairman*

A Municipal College

By Louis Sattler

The chemistry department at the Brooklyn branch of the New York City department of higher education. Some specific problems.

THE city of New York provides a free college education as a part of its general educational system. Admission to the municipal colleges is open to all high school graduates—though at the present time only the upper two-thirds of the applicants can be taken care of. Even with this restriction, a total of 1800 students were admitted to this year's terms of Brooklyn College, the newest unit in the development of the New York City educational plan.

To take care of this influx of students Brooklyn College has had to expand its physical equipment rapidly, especially as regards the chemistry department. Mark Hopkins on one end of log and a student on the other, may constitute a college—but hardly a college with a course in experimental chemistry.

In 1926, Dr. Frederick E. Breithut came to Brooklyn to an office building which had been leased by the city to house the new college. There was no chemical equipment of any sort; but in a short time classes were meeting, instructors were lecturing, and students were poring over books and papers while mechanics busily hammered and drilled, putting together the new laboratory.

The first year, two laboratories and a small stock-room provided adequate accommodations for the 291 students. Now the various stock-rooms have a total area equal to ten times that of 1926; and registration in the department in 1932 was 1136. In a city the size of New York, Brooklyn College is overshadowed by other large educational

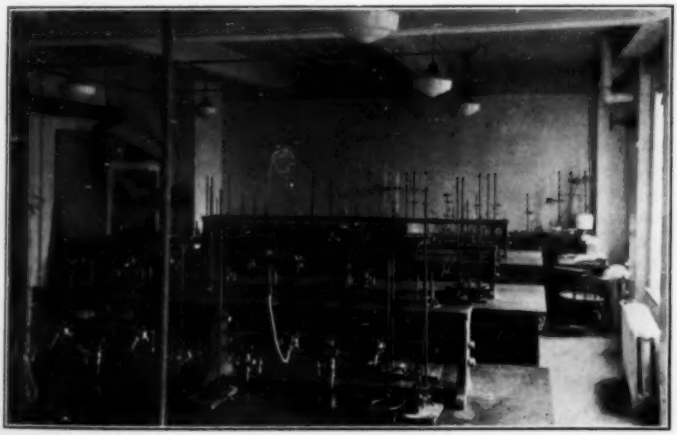
institutions; yet the registration in chemistry courses alone is greater than the total student body in 73.7 per cent of the colleges and universities in the United States.

Originally the school was merely a branch of C. C. N. Y., and as such was more or less a junior college. The women's division was a branch of Hunter College, and served mainly to relieve the load on the parent institution. The courses given were those of the freshman-sophomore years; and it was taken for granted by almost everybody that the quarters at 80 Willoughby Street were only temporary, and that an honest-to-goodness college with its own campus and its own chemistry building would soon be built. There was no expectation of offering new courses until then. Plans change suddenly, however; and so, when there came a call for a course in quantitative analysis, a laboratory for this subject was soon designed, built, and equipped.

Two years ago Brooklyn College began to give junior and senior courses, which meant a new influx of students who previously had gone to City College. Moreover, Brooklyn is one of the fastest growing boroughs of the city, so that the pressure of high school graduates is constantly increasing.

Continuing Expansion Problems

Perhaps this practice in rapid expansion was a good thing, for a still harder job was coming, the consolidation of the women's and men's divisions, which task also fell on Dr. Breithut's shoulders. During the



ORGANIC LABORATORY

Christmas holidays of 1930 the laboratories were dismantled in the Court Street building, an office building in which the city had rented space. They were moved in five days, and were installed in seven days more in the Willoughby Building. The total time required from the removal of recitation room walls to the completion of the organic laboratory was nine days.

Other recitation rooms were made into an inorganic laboratory in the same way, this transformation also taking less than two weeks.

While these activities were in progress, Professor Breithut found time, as a sort of parenthetical job, to arrange the designing of the laboratories in the Commerce Building at Twenty-third Street and Lexington Avenue, Manhattan, with accommodations for seven hundred students.

The actual carrying out of such orders falls upon the shoulders of Mr. William G. C. Huebner, better known as "Papa" Huebner, or "P. H." In his office are elaborated the many details that are part of the routine of running a department of chemistry.

The following tabulation shows the courses and the number of students in each course at the present time:

STUDENT REGISTRATION

SPRING TERM 1932

Course	*Men's Division*	*Women's Division*	*Evening*	*Total*
General Chemistry 01 (Without high school chem.)	118	46	20	184
General Chemistry 1 (With high school chem.)	117	35	71	223
General Chemistry 02	111	38	23	172
General Chemistry 2	139	19	35	193
Qualitative Analysis 1	50	68	24	142
Qualitative Analysis 2	11	6	...	17
Quantitative Analysis	40	14	...	54
Organic Chemistry 1	57	5	24	86
Organic Chemistry 2	32	...	...	32
Physical Chemistry	18	3	...	21
Physiological Chemistry	...	...	12	12
	693	234	209	1136

The handling of such numbers of students in limited facilities and in a building which was not originally designed for chemical laboratories

SPACE-ECONOMY: OFFICE AND STOCK-ROOM COMBINED

constitutes an almost unique situation. All laboratories are in use almost continuously; but despite the wear and tear of this hard usage (since 1926 a total of 9999 students have been registered in the department), these laboratories are in excellent condition. It speaks well for the staff, who have never hesitated to pitch in and do the kind of work which one might consider janitorial service.

Special Courses Given

From the modest start of elementary courses in chemistry, the department has expanded to such an extent that not only the basic courses are given but also physiological chemistry and other courses in advanced work in the various basic fields. With the new school year next fall, properly qualified students may elect a special problems course in which they will receive their first taste of the pleasures of research. Brooklyn College will ultimately be in a position to offer as extensive a training in the academic side of chemistry as City College can now give to students in the engineering and applied aspects of the science.

The present staff are particularly interested in the following diverse subjects:

Dr. George Bacharach: Aromatic nitration reactions, benzanthrone dyes, analytical chemistry.

Dr. David Hart: Analytical chemistry, identification of anions.

Dr. Teresa Masterson: Physiological and physical chemistry of meningitis.

Dr. Martin Meyer: Popular lectures, sulphur compounds, theory of ionization.

Dr. Dorothea Mossman: Analytical chemistry, titanium.

Dr. Louis Sattler: Electronics in organic chemistry, conductivities of raw sugar solutions.

Dr. S. Bradford Stone: Physical chemistry isotopes, viscosity. Editor of the *Journal of Rheology*.

Dr. Ione Weber: Physiological chemistry, nucleosidases.

A local chemistry club has been formed and has been carrying on vigorous meetings. Brooklyn College is rather proud of the enthusiasm which the chemistry department creates among its students. In the evening the lecture rooms which have so often heard that Fe plus S yields FeS are occupied with discussions of dipole moments, magneto-optic analysis, and the Raman effect. This interest is displayed among even those tired young men and women who come to school at night after a regular working day and start almost a new working day of four hours. The evening session has its own chemistry club, which frequently must be ejected forcibly by the building superintendent at midnight.

The following table shows the registration in the evening department:

STUDENT REGISTRATION

	1927	*1928*	*1929*	*1930*	*1931*
Spring	37	95	111	113	177
Fall	93	97	104	111	174
	130	192	215	224	351

The increase has kept pace with the quiet expansion of the courses in the day session. Organic and physiological chemistry were given for the first time this semester, and the near future will see the inclusion of other advanced courses.

The summer session, too, has had its place in helping students make up extra time and in assisting more mature people who have need for special work in chemistry. Since 1928, more than 300 students have studied during the hot summer months. Originally there were only 24 students; in the summer of 1931 there were 114. The reason for the slow growth of the summer school lies not in the dearth of serious students but in the financial circumstances of the city.

A municipal institution has vividly before it the question of money. A privately endowed institution charges about $500 a year for its

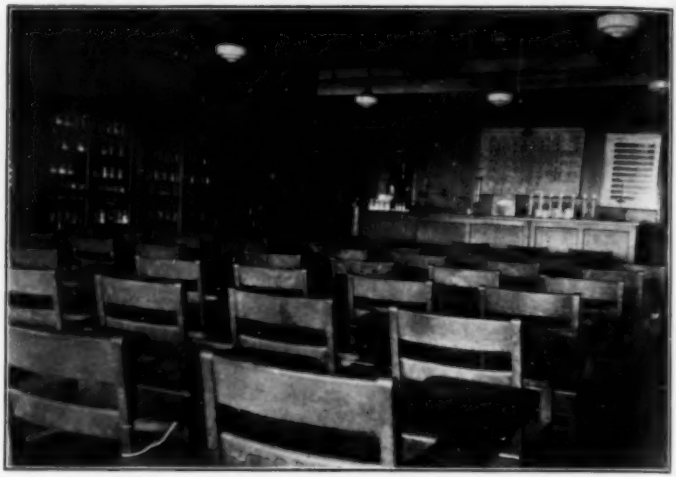
LECTURE PREPARATION ROOM

tuition, and does so at a loss. Brooklyn College, with its present budget of $1,660,000, manages to provide a college education which costs $240 per student and which includes not only instruction but supplies and equipment as well. This calls for careful planning. In a privately endowed school the science departments are run at a great financial loss, which must be made up in the other departments. There is usually liberal treatment when it comes to supplies and equipment for research. In a municipal institution research is necessarily relegated to a minor place, and section sizes are somewhat larger. Notwithstanding all these harsh financial realities, Brooklyn College has been able to carry out research with only a few hindrances.

The courses, except for the special courses already described, are similar to the usual basic subjects. Freshman chemistry is a prescribed course, so that a large number of students are compelled to get a taste of the subject, whereas formerly the students who majored in chemistry were mainly those who were taking the professional work leading to medicine and dentistry. This preliminary course has aroused the interest of many students to the point of their taking electives in chemistry because of their interest in the subject for its own sake.

The Class of Students

The process of weeding out the lower third of the applicants for admission gives a class of entering freshmen whose average high school



LECTURE HALL

grade was between 75 and 80. Since the high schools are strictly controlled by the New York State Board of Regents, these incoming students represent a uniformly trained group. Those who have had a year of high school chemistry are capable of taking a college course in inorganic chemistry which stresses the physico-chemical aspects. The advanced courses are the beneficiaries of these well-trained and industrious students, who constantly keep up among themselves a terrific pace of competition for high marks.

As yet, no students have graduated who have taken a major sequence of courses in the chemistry department, and so there is no information as to what happens to Brooklyn students after they leave school. However, the seniors seem inclined to enter the high school and college teaching fields, and, of course, medicine and dentistry. Only an insignificant number have ambitions to become practicing chemists employed in either the consulting or industrial sides of the profession.

The future naturally is uncertain. But this much can be said: If tomorrow the word comes that the city is ready to built its $20,000,000 college with a $2,000,000 chemistry laboratory, there will be no rushing around. Professor Breithut will summon Mr. Huebner and say: "Huebner, please go over to the president's office with these plans."

Fees for Chemical Services

By W. C. Dumas

The head of a consulting organization discusses the advisability of standardizing. Minimun fees among chemists. The evil effects of bidding for business in the professional field.

ONE of the objects of a professional organization is to secure for those engaged in it adequate returns for their services, commensurate with the years of study and experience required. Ways and means of getting salary increases for workers in chemical employment have been frequently discussed by the American Institute of Chemists; but so far as the writer is aware, the matter of minimum fees for independent laboratories and consultants has not yet received the proper attention.

It may never be desirable or wise to engage in a campaign of price-fixing or fee-fixing in a profession. It is also doubtful if it is possible to do so. But at the present time throughout this country the whole subject of fees for different classes of service is far from satisfactory. There is too much variation in fees for the same or contiguous territories. At present, generally speaking, the minimum fees for all classes of chemical services are too low.

In most professions there are *minimum* fees for certain classes of services. As a whole, these minimum fees are adhered to by the members. While there is nothing to prevent a member from charging more than the minimum fee for a service, if the case warrants it, it is seldom that he will charge less.

Unfortunately this practice does not hold so well among the various analytical and consulting laboratories of the country. Fees are far from standardized, and sometimes are lower than the wages of common laborers. Of course, unreasonably low charges for professional services tend toward inferior and unreliable work. Even in the field of ordinary analytical work, where the chemist knows beforehand exactly what has to be done by standardized methods, there is a great range in prices among the various laboratories. This condition often prevails in the same section of the country or even in the same city.

In common with the rest of mankind, the chemist has to make a living.

He is in the business world as well as in the professional world. His profession occupies a position on the border line between the two; and he must use his best judgment in the matter of gaining an adequate return from his practice. But he must use it with the help of guiding ethics that safeguard his practice and with business methods that will insure a fair profit on his operations.

IT IS quite natural for a young man just entering the profession of chemistry, especially if he is doing so independently, to reduce fees for services in order to get business. He is now in business and in competition with others and is merely using ordinary business methods that are used daily in the sale of other commodities. His services are commodities and to him are for sale on the same basis as any other product.

This line of reasoning can be readily understood in the case of the young man. But unfortunately such practices are not confined to such chemists. Sometimes well-established laboratories also engage in drastic fee reduction in order to get business. These fees may be far below what is necessary for a fair return to the laboratory. Laboratories are also asked to *bid* on certain projects in a competitive manner just as competitive bids are let among contractors.

Unfortunately *more* business is not created by such procedures. The practice only results in a shift of the volume of business from one laboratory to another. More business can be created, however, by doing thorough, good, and valuable work. Then the charge should be in proportion to the service rendered.

In the absence of some uniform scale of *minimum* fees covering various classes of services and adopted by reputable practitioners, this condition, no doubt, will always prevail.

The writer is not advocating price-fixing in the ordinary sense of the word, but he believes that some discussion of the matter in the columns of *The* CHEMIST would be valuable. Should minimum fees be indicated or fixed? Should fees for certain classes of chemical services *ever* be standardized?

Chemistry and the Citrus Industry

By W. E. Baier

The part that chemistry plays in one branch of American agriculture. The chemical development of by-products as a method of solving the overproduction problem.

THERE is involved in the citrus industry of California a well diversified chemistry. Particularly must one not forget the citrus products industry, which is basically founded upon chemical research. But first let us discuss the industry as a whole.

Thirteen thousand growers, organized in a single marketing cooperative, California Fruit Growers, Exchange, purchase advantageously equipment and supplies through a supply company. This latter is for the most part a purchasing department but is of sufficient magnitude to own or lease its forests and operate economically its own lumber mills for the production of box shook. The grower can start at the beginning with his supply company purchases, nursery stock and buds being available at savings.

The State Department of Agriculture helps protect the growers' interests in connection with many of the materials which are required, demanding samples for analysis and certification, so that chemical examination on the part of the supply company itself is rarely necessary. Such chemical control is nevertheless part of the chemistry of the citrus industry. It will be apparent, without special mention, which of the supplies going into the groves are of a nature to require the service of chemists somewhere in their manufacture and control. The chief supplies are:

Water for irrigation, low in alkali and containing less than 1 p. p. m. boron.

Fertilizer, organic and commercial.

Lime (emulsified refined), sulphur, petroleum oils, chemical spreaders, and hydrocyanic acid for pest control.
Orchard heater oil for frost protection.
Cover crop seed, fuel for tractors, miscellaneous supplies.

In the use of these supplies and particularly of the soil itself the growers employ the services of numerous local soil laboratories, manufacturers' agents, and their own chemists and entomologists.

Fruit Itself Chemically Tested

When oranges or grapefruit first arrive at the packing house, if early in the season, samples are taken for maturity tests. Certain requirements as to color as well as ratio of soluble solids to acid content must be fulfilled. In most cases samples have already been procured from the trees of the particular grove before starting the picking crews.

The fruit may or may not be fully colored at this stage, although satisfactorily mature. Ethylene gas in warm moist air (1 : 5000) brings out the inherent natural color of the fruit in a few days—a process thus simply described, but one on which fully a hundred thousand dollars have been expended in research by government, manufacturing, and growers' agencies. Several chemically trained men have been employed directly by packing houses to boost coloring efficiency by improved fruit handling and by controlling temperature, humidity, ethylene, and carbon dioxide in the coloring rooms.

The growers' tender care of the groves makes itself apparent not only by high quality of fruit, but also in residues on the fruit of spray oil, orchard heater oil, soot, and dust from cultivation, all of which must come off at this time. The cleaning of citrus fruit is not always a simple task. Naturally there is a limit to the temperature and alkalinity of the detergent solution. Considerable chemical research work has shown the proper kinds and amounts of soap, alkaline detergents other than soap, and if the fruit is smudged, kerosene or cleaners' solvent emulsion.

Chemically Treated to Prevent Shrinkage

Treating of the fruit to increase resistance to decay and shrinkage is accomplished by various means. Here again much research work has been done by the government, and by commercial and growers' organizations. Treating materials include borax, boric acid-borax mixture, soda ash, sodium bicarbonate, pine oil, and sodium hypochlorite. Wax, usually mixtures of paraffin and carnauba with other materials, is used to some extent for appearance and to prevent shrinkage. It is applied

A LEMON GROVE, SHOWING SMOKE POTS

from polishing brushes contacting a solid slab of the wax, or the melted or dissolved wax is sprayed or "fogged" on the fruit, or else applied in the form of a water emulsion. When it is considered that too soft a wax and too much wax must be avoided because of the detrimental effect of sealing all the stomata of the fruit, the need for chemical supervision in the preparation of the materials will be appreciated.

Refrigeration and ventilation play a very important part in precooling, storage, and shipping, whether by rail or water. As these and the remaining steps in the handling of this packed fruit are largely mechanical, we may go back to follow the less fortunate fruit which is destined to a shorter, more sedentary life in the products industry. This is fruit that may be misshapen, over or under size, blemished, or otherwise unfit for shipment. It readily stands the hauling, of at most a hundred some odd miles, to the products plants which are ever in readiness to convert such fruit into a wide variety of reasonably stable products. The sale of these pays all conversion, sales, and trucking expenses and yields a modest salvage on the fruit, not, however, equal to the growers' cost of production.

The development of products of citrus fruits to afford outlets for these (surplus) oranges and lemons has received a great amount of attention. Past experience has taught that diversified products utilizing the different parts of the fruit are essential if the products industry is to serve satisfactorily its grower owners during all periods—when fruit is scarce,

when it is plentiful, or when there come large tonnages of windfalls or frozen fruit the juice from which is valueless as such. Here then is challenged the best efforts of the chemical engineer in a favorite field, that of utilization of waste.

While products are thus diversified they must be, as far as possible, basic materials in concentrated form, easily warehoused, and dissociated from costly purchased ingredients. This necessity is readily appreciated when it is known that the supply of surplus fruit available for products purposes may vary 600% from one season to the next.

Probably the best established and standardized division of the citrus products industry is really the most chemical one. I refer to the extraction of citric acid from lemons. An intermediate product, citrate of lime, offers a convenient and economical form for storage and serves as a balance wheel to make possible economical operation in spite of the extreme variations in supply of raw material. The decomposition of the citrate, purification and concentration of the acid, and finally two or more crystallizations are thus most efficiently accomplished with the minimum of equipment.

However, the first steps in the handling of either oranges or lemons must be provided for in plant capacity equal to the maximum daily receipt of fruit. The steps are mechanical, consisting of sorting, washing, and crushing to liberate juice and essential oil from the pulp and peel.

In addition to the first grade or cold pressed oil there are obtained by distillation other grades of oils and also citrus terpenes. The latter, through the efforts of chemists, has been shown to have real possibilities in technical uses where the properties of the terpene limonene, together with pleasant odor, are advantageous. Odor associated with other sources of similar terpenes is usually quite inferior to that of citrus terpenes.

Pectin the Product Interesting to Chemists

While there have been many chemical and bacteriological problems connected with the production of citrus juices and sirups which are vacuum concentrated, preserved, or frozen, the chemists' interests have been most strongly attracted toward citrus pectin and pectic substances. Pure citrus pectin is marketed in large quantities in powdered form for diversified food uses, the most important being jams and jellies. In many respects citrus fruits offer the best source of pectin, the only other commercial raw material being apples.

Properties of pectin depend to a great extent upon the conditions

under which it is liberated from the water insoluble mother substance, the so-called protopectin of the fruit tissues. Kind and amount of extractive acid are especially important. The pectin-bearing albedo or white part of the rind of citrus fruits is not directly associated with acid, nature having carefully segregated these components. As a consequence, when the peel is prepared for extraction, very accurate control of this acid factor is possible. For pectin intended for certain uses the citric acid natural to the juice is suited. For other purposes mineral acids are superior. Flavor and starch, both troublesome in the manufacture of pectin from apples are absent in the pectinous tissues of citrus. The glucosides hesperidin and naringin are present in citrus, but unlike starches are not precipitable by alcohol or other reagents used in pectin manufacture.

Chemical investigation has shown the inter-relation of such properties of citrus pectin as jelly grade (or pounds sugar per pound pectin which may be set to a jelly under specified conditions), time of set, active acidity and electrometric titration, amount and type of ash, ease of dispersion, methoxyl and pectic acid contents, emulsifying power, and color. These, in turn, have been shown to be largely attributable to certain conditions of process and in part to conditions of the raw material. By suitable control large scale operations result in pectin products of remarkable uniformity, which meet the exacting requirements of the preserving, confectionery, baking, pharmaceutical, and other industries.

Other Pectin Products

Pectic acid is the next simpler pectinous substance. Starting with the original water-insoluble protopectin of the fruit there comes the water-soluble pectin, then water-insoluble pectic acid, and finally galacturonic acid, which is again soluble. Pectic acid is a very stable substance, dispersible under certain conditions and capable of forming gels. Its alkali metal salts are soluble, but the calcium salt is extremely insoluble.

Citrus pectic acid is destined to serve many important uses as a protective colloid in photography, foods, rubber, detergents, electrochemistry, etc. Pectin is not a single chemical compound, and likewise the pectic acids are probably numerous. The extension of the uses of the pectic substances will come through fundamental research into the physical and chemical properties. This is but one of the many developments in which chemists, restrained only by the wise limitations of sound economics, serve the California citrus industry.

BOOK REVIEW

Science and First Principles. By F. S. C. NORTHROP. *Macmillan.* $3.00.

Whatever the ultimate good effect of Einstein's theory of relativity, the immediate effect was certainly bad. The publicity given Einstein aroused people's interest in the opinions of mathematical philosophers, which would have been a good thing if the public had known enough about mathematical philosophy to distinguish the sound thinkers from the able publicists.

Once the world was convinced that scientists' theories were tottering, the sensation-mongers rushed into print with more and more fantastic ideas, chosen not so much for their scientific accuracy or even probability as for the fact that they made exciting reading. The Oliver Lodges and Arthur Conan Doyles were replaced by a new crop of fakers whose position was almost impregnable because the phenomena with which they dealt were not demonstrably spurious, as were the phenomena which deceived (to put it charitably) the prolifically writing spiritualists.

This time, unfortunately, it was not only the public who were misled. Also led astray were those mentally active but shallow thinkers who do much of the molding of public opinion. An outstanding example is George Bernard Shaw, whose "Too True to Be Good" indicates what can happen to a brilliant but aging mind when told that science is no longer sure of its ground.

The fact is, of course, that science has never been sure of its ground, and has been quite willing to say so, whether ten years ago when faced with electrons which on mathematical analysis turned out to be nothing at all revolving with the speed of light, or now when it finds that its atoms are perhaps waves and its waves are particles.

If the Deems lectures of New York University, delivered in 1929 and not collected until 1931, had been put into print a little earlier we might have been spared some of the absurdities which filled even the reputable magazines: the statements, for example, that the great new discovery of indeterminism had overthrown science, and even (though this had to be disguised a little) that the probability of all events was one-half.

Dr. Northrop gives a clear picture of the evolution of the various modern theories and picks out with a deft, sure touch those which are worthy of consideration and those which are unsound on their very faces. He does not hesitate to apply the expression "sheer nonsense" to the theories of Jeans; and he gives the information—new to this reviewer—that Heisenberg has been driven to confess publicly that man's inability to determine both the position and velocity of an electron in no way affects the existence of a cause-effect relationship.

These examples of the helping hand of an expert indicate the book's chief value, though to a layman with no scientific training at all the discussions may prove pretty heavy going—as they will, in fact, to the average scientist involved in the Riemann geometry, which Dr. Northrop does not wholly manage to avoid in his discussion of the theory of relativity.

In addition to relativity and the quantum theory, the author discusses biology, including man and man's psychological make-up, under the old Greek theory that the fundamental principles underlying all nature can be studied in any branch of science—though there may be some question whether the sciences have been investigated far enough to reach the starting point from which they all spring.

If we have a criticism of the book, it would be that in many instances the author might have cited the experiments which make certain theories untenable. He has assumed this knowledge on the part of his readers, which is certainly not the case in regard to the layman, to whom the publisher's blurb says the book is addressed; and Dr. Northrop also might easily have made somewhat clearer the implications of those experiments which he does cite, such as that involving the amount of light needed to knock electrons out of atoms.

The book is worth reading, if for nothing but the statement:

"Place one of our contemporary physicists in a New England trout stream, and he could easily convince himself that reality is nothing but water, so great is his capacity to concentrate upon that which is most immediately observable at the moment."

It is possible to devise a mathematically sound formula according to which any object would shrink to nothingness at the slightest pressure. Not much elaborate equipment is necessary to prove the existence here of a physical if not a mathematical fallacy; but it is a little more difficult to prove experimentally that an exploding world is perhaps just as much a myth. Dr. Northrop's book will help the reader to decide which theories are sound scientific steps to the eventual solution of the problem of the universe. E. L. G.

OUR AUTHORS

"Stepping Out"

Chandler D. Ingersoll, Ph.D., F.A.I.C., author of the article "New Paths in Chemistry" in the February CHEMIST, is interested in the problems of the chemical profession and in devising rules to guide the young chemist. Gifted with a clear, logical mind, he starts from fundamental principles and generally brings up for discussion some new phase of any question.

Dr. Ingersoll lives in Westchester and likes to convince listeners that it is New York's finest suburban area. His favorite recreation is tennis.

Bureau of Mines

Arno C. Fieldner, an Ohio State graduate, is a former head of the Pittsburgh Experiment Station of the Bureau of Mines. He had charge of research on the ventilation of vehicular tunnels, for the successful completion of which project he received the Lamme medal of Ohio State University in 1930. During the war he was a major in the Chemical Warfare Service, engaged in gas mask research.

Mr. Fieldner's present scientific interest is coal research. His favorite recreation is fishing and canoeing on the Canadian lakes.

Pre-medical Requirements

Jack P. Montgomery, F.A.I.C., Ph.D. (Virginia) began his teaching career at Mississippi A. & M., then went to the University of Alabama, where he has been for twenty-one years. Students and faculty address him affectionately as "Dr. Jack."

Dr. Montgomery's article on pre-medical education discusses a subject in which he has long been interested. He is also interested in other professional questions; and he is the author of another article which will appear in an early issue of *The* CHEMIST.

Dr. Montgomery likes fishing trips, not so much for the peace and solitude as for the fun of catching fish. Like many other intelligent people, he dislikes the radio.

Chemical Employment

Frank G. Breyer, F.A.I.C., is largely responsible for the organization as well as for the successful carrying out of the work of the Committee on Unemployment. As member of the firm of Singmaster & Breyer, chemical and metallurgical engineers, he has contributed his time and his fine organizing ability unselfishly in the interests of unemployed chemists and chemical engineers.

Dynamic, forceful, Mr. Breyer is an able executive, expresses himself strongly on the need for employment planning in the chemical profession.

Professor in a Municipal College

Louis Sattler, F.A.I.C., Ph.D. (Chicago), began his chemical career before his college days. After four years as laboratory assistant at the Rockefeller Institute he held a chemical position with the Packard Motor Company, finally entered Columbia in 1919 to start taking freshman chemistry.

Dr. Sattler is now chairman of the organic chemical division at Brooklyn College. His past research includes investigations of raw cane sugar. At present he is studying a method for determining turbidity in colored solutions.

Like the head of the Brooklyn department of chemistry, Dr. Sattler is a musician, with the violin as his favorite instrument. His chief other hobby is photography.

Department Store Chemist

Ephraim Freedman, F.A.I.C., was educated at Columbia University. After experience in a number of chemical positions, including the Chemical Warfare Service, he became director of Macy's Bureau of Standards in 1927.

A member of several committees on materials-testing, Mr. Freedman has had wide experience in his field, and is the author of a number of papers describing this work.

What Mr. Freedman modestly did not mention in his address is the fact that he personally developed many of the new pieces of apparatus needed to handle the great variety of testing problems that are brought to the Macy laboratories.

Fees for Chemists

W. C. Dumas, F.A.I.C., a graduate of the Georgia School of Technology, 1906, began his career in chemistry in the old N. P. Pratt Laboratory, Atlanta, Ga., soon after graduation from college. Most of his professional career has been in general consulting work, with the exception of several years as State Chemist of Georgia.

Mr. Dumas has many other interests besides chemistry. Among them are the cultivation of flowers, the study of philosophy, and motoring.

Biographer and Associate

Florence E. Wall, F.A.I.C., can speak with authority of Dr. Breithut's work as president of The American Institute of Chemists.

It was while she was editor of *The* CHEMIST that Dr. Breithut carried out some of his most constructive work. More than any one else, Miss Wall saw what went on and is in a position to tell the story.

The author of the biography of Charles H. Herty in the February CHEMIST and herself the subject of the sketch, "A Versatile Woman Chemist," in the March issue, Miss Wall is known for her literary ability as well as for her efficiency in chemical research, especially cosmetic research.

An experienced publicist, writes for technical journals, and makes a specialty of technical publicity and advertising. She has just been re-elected secretary of the New York League of Advertising Women.

Citrus Fruit Chemist

Willard E. Baier was graduated in 1923 from the California Institute of Technology, and immediately went into the citrus products field as a chemist with the California Fruit Growers' Exchange.

Mr. Baier is tall, twenty-nine, married, and is now manager of the research department of the exchange.

INSTITUTE NOTES

National Council

The ninetieth meeting of the Council of The American Institute of Chemists was held at The Chemists' Club, 52 East 41st Street, New York, N. Y., on Thursday, April 14, 1932.

Dr. Henry G. Knight presided in the absence of President Breithut.

The following councilors and officers were present: Messrs. Arnstein, Cayo, Harold, Herstein, Moody, Neiman, and Zons. Mr. E. L. Gordy, editor of *The* CHEMIST, was also present.

The Secretary read letters from several members of the Institute who are seeking employment.

The Secretary read a letter of April 14th from Mr. E. F. Cayo, Chapter Representative from the Pennsylvania Chapter, containing a number of suggestions, all of which were discussed in detail. It was the opinion of the Council that the Pennsylvania Chapter should seek the cooperation of employers in raising the funds for unemployed chemists; that at the present time it is inadvisable for the Institute to pay the expenses of Councilors or Council Representatives to the meetings of the Council; and that the Institute should furnish chapter stationery.

The report of the Treasurer was received and ordered filed.

The Secretary reported for the committee appointed to obtain statistics as to the unemployment among members of the Institute.

Dr. Knight, chairman of the Committee on Ethics, submitted its report. It was

RESOLVED, That Section 8 be revised to read as follows: "Advertising matter containing his name shall be dignified in tone and characterized by due scientific restraint. Such advertising matter shall not contain any statements which may tend to bring himself

or his profession into disrepute. Equivocal or false statements, or statements which are liable to mislead shall not be permitted. The use of personal photographs or self-laudatory statements is condemned. If a title is used, it must be definitely characterized."

Further, that Section 13 be revised by inserting in the second line after the word "employer" the words "as substitute."

Further, insert in Section 18 at the end of the fourth line the following sentence: "This agreement should include a restriction of the use of reports for advertising purposes."

Further, that a sub-section be added to Section 18 designated as Sub-section (e) to read as follows: "He shall not suppress information or unduly accentuate statements in reports for the purpose of making gain or profit to himself or others."

The recommendation that the application blanks and receipts for dues contain a waiver of any recourse after expulsion from membership for proved infraction of the code of ethics was referred back to the Committee on Ethics for a further report at the next meeting of the Council.

The committee appointed to consider the advertisement of Velo-Derma Corporation made its report and the Secretary was directed to refer the matter to the Better Business Bureau.

The Secretary read a letter dated March 22, 1932, from W. J. Bačza, Secretary of the Volunteer Workers Committee, expressing the appreciation of that Committee for the contribution of the Institute.

The Secretary reported upon the present standing of the Institute membership.

HOWARD S. NEIMAN, *Secretary*

New York Chapter

In the absence of Mr. Frederick Kenney, chairman of the Chapter, Mr. Karl M. Herstein presided.

The Secretary read a communication to the membership from the Committee on Unemployment and Relief for Chemists and Chemical Engineers. The communication included resolutions adopted by the mass meeting of the several societies on March 4, 1932.

The report of the Nominating Committee was submitted by Miss Calm M. Hoke. In accordance with constitutional provisions additional nominations were received.

A report of the Constitution Revision Committee was presented by Mr. Herstein. The several changes recommended for the Constitution were read, and the Secretary was instructed to send copies to all members of the Chapter.

Following the business meeting Mr. Ephraim Freedman, F.D.A., Director, Bureau of Standards, R. H. Macy & Co., Inc., spoke on "The Chemist in the Department Store." In a masterly manner he traced the development of his unusual and valuable department in the merchandising plan of the Macy Company. Through the citation of numerous specific instances he made clear the function of professional chemistry in its relation to the purchasing of merchandise, the control of merchandise quality, and the accuracy of its description even in the store's advertising.

Among those who discussed the paper was Dr. J. F. X. Harold, whose consult-

ing practice has included contact with textiles. He gave a critical evaluation of the Bureau's work and he pointed out the fact of Mr. Freedman's contributions in devising special test apparatus. In view of the equipment of the laboratory, and the ingenuity and general excellence of the work accomplished, Dr. Harold characterized the Macy Bureau of Standards as without parallel in its field.

LEON V. QUIGLEY, *Secretary*

Pennsylvania Chapter

The speaker was Dr. Alexander O. Gettler, Toxicologist to the City of New York, and a leader in medico-legal investigations in recent years. Something like an adequate idea of the amount of medico-legal work demanded in such a large city is obtained when one learns that Dr. Gettler analyzes chemically about two thousand cadavers a year (about six a day).

In addition to describing some of the interesting cases on which he has been engaged, Dr. Gettler showed a number of striking samples obtained in his work. Among them were vials containing the heroin from Jeanne Eagels' brain, veronal from the brain of Emily Stephens, luminal from Starr Faithful, chloroform from the brain of Ruth Snyder's husband, and a sample of whiskey given to Judd Gray by Ruth Snyder, with the professed intention of giving him strength to face the ordeal of the trial. The quantity of bichloride of mercury contained in this would have made the electric chair quite unnecessary.

Perhaps the most interesting exhibit was a collection of bones or remnants of bones from one of the victims of the recent radium poisoning cases in New Brunswick, N. J. These bones were highly radioactive, as shown by prints from photographic plates exposed to their action, and were also badly disintegrated.

Dr. Gettler also described his research in devising a post-mortem test for intoxication. He believed that the concentration of alcohol in an individual's brain could be used as an index to that person's state of sobriety, and he determined to prove this fact.

The experimental work on this problem covered several years and included data on six thousand human cases and many hundreds of dogs. Working with the animals first, he developed a set of dogs which could be considered the equivalent of habitual drunkards. These were killed when in various degrees of intoxication, as were also animals unaccustomed to alcohol but rendered intoxicated, and the brains were analyzed for alcohol in every case.

From these results, as well as from analyses on humans who were unquestionably intoxicated at time of death, Dr. Gettler proved that an alcoholic content in the brain of more than 0.25% was indisputable proof of intoxication. The quantity of alcohol taken by mouth is no criterion, for the habitual drinker is able to oxidize much larger quantities of alcohol in all his tissues than the normal individual. The alcoholic content of the brain never rose to more than 0.6%. In the normal individual the equivalent of about one third of a drop of alcohol is found in fifteen hundred grams of brain.

Among the unusual cases described was that of a physician who reported the death of a young woman in his office

stating that she had come to him for treatment after having had an abortion performed by another physician, and claiming that she had suddenly died while telling him of her case. The coroner was not quite so gullible as the physician had hoped, so Dr. Gettler was again called in. He found 156 milligrams of chloroform in the young woman's brain, just about the quantity his experience had shown him could be expected when death occurs under chloroform anesthesia. Needless to say, the physician was found guilty of malpractise.

HOWARD STOERTZ, *Reporter*

New Members

FELLOWS

HENRY ARNOLD BAKER, *Professor*, John Tarleton Agricultural College, Stephenville, Texas.

SAMUEL HENRI CON'E, *Director of Research*, Paint Dept., Sinclair Refining Co., 45 Nassau Street, New York, N. Y.

HARRY GUSTAVE LINDWALL, *Assistant Professor*, New York University, University Heights, New York, N. Y.

ASSOCIATE

CHARLESANNA B. COLES, *Graduate Student*, 6742 Irving Avenue, Merchantville, N. J.

JUNIOR

MILTON KADISHOWITZ, *Student*, 538 Essex Street, Brooklyn, N. Y.

FRANK ANTHONY DEHELFY was raised from Associate to Fellow. J. HARRELL SORRELS was raised from Associate to Fellow.

Applications for Membership

FELLOWS

ALAN PORTER LEE, *Chemical Engineer, Editor*, 123 Liberty Street, New York, N. Y.

LAWRENCE W. BASS, *Director of Research*, The Borden Company, 350 Madison Avenue, New York, N. Y.

NEWS

Carleton Ellis, F.A.I.C., addressed the Philadelphia Section of the American Chemical Society on April 21st. His subject was "Chemical Reactions at High Pressures."

Charles H. Herty, Jr., addressed the Cleveland Section of the American Chemical Society on "Chemical Engineering in the Steel Industry."

Rotenone

The Bureau of Chemistry and Soils announces that chemists of the Bureau of Laboratories have determined the chemical structure of rotenone. It is hoped that eventually synthesis of this ideal insecticide will be possible.

Although poisonous to insects, both in contact and in the stomach, rotenone has no effect on human beings and other warm-blooded animals.

The American Association of Cereal Chemists will hold its annual meeting May 23rd to 26th at Detroit, Michigan. Headquarters will be in the Statler Hotel.

New Rayon Source

Chemists of the Department of Agriculture have developed a process for making rayon from bagasse, the residual sugar cane waste. The experiments were carried out by **D. F. J. Lynch,** F.A.I.C.

The new process, which uses low-priced nitric acid, is expected to provide a method of utilizing the half million tons of bagasse which accumulate in the United States every year.

Industrial Uses of Sugar

Intensive study is now being made of cane sugar as an industrial raw material. Drs. Gerald J. Cox and John Metschl, of Mellon Institute of Industrial Research have reported that sucrose octacetate has been found valuable in certain types of lacquers and adhesives and in the fabrication of paper. A similar product, sucrose benzoate, has applications in the same fields.

By treatment of sugar with acid at high temperatures, a substance called levulinic acid is produced. When combined with certain alcohols it forms fragrant esters that have useful solvent powers.

GERALD J. COX

Of greatest interest, however, is the investigation of the practice of mixing sugar in lime-sand mortar. Tests have shown that if as little sugar as 6 per cent of the quicklime is included in mortar, the tensile strength is increased about 60 per cent. With the present low price of sugar, the addition of 5 or 6 pounds of sugar for each 100 pounds of lime adds very little to the cost.

Luncheon to President

Francis P. Garvan, newly elected president of the United States Institute for Textile Research, was the guest of honor at a reception-luncheon at the Biltmore on May fourth.

Other speakers, in addition to Mr. Garvan, were Karl T. Compton, President of the Massachusetts Institute of Technology; Charles H. Herty, F.A.I.C.; Morris Holland of the National Research Council; and W. D. Appel, chief of the Textile Section of the Bureau of Standards.

R. A. Gortner, professor of agricultural chemistry, University of Minnesota, has been elected president of the American Society of Naturalists for 1932.

J. G. Davidson has been elected president of the Carbide and Carbon Chemical Corporation.

J. E. Lockwood has resigned from Hercules Powder Company to open a consulting office in Savannah, Georgia. He will specialize on naval stores problems and development.

William H. Zinsser has been elected president of the United States Shellac Importers' Association.

Fines Imposed

The corporations and individuals pleading nolo contendere in the alcohol conspiracy trials have been fined by the Federal courts as follows:

$10,000 and Costs

The United States Industrial Alcohol Company, Amazon Industrial Chemical Corporation, American Solvents and Chemical Company, Slidden Company.

$5000

American Oil & Supply Company, Filben Chemical Company, I. Sagovitz & Sons, North Hudson Chemical Company.

$2500

Max Sagoritz.

$1000

Syrup Products Company, Joseph J. Darvin, Nate Scharlin, Louis Fredella, Rudolph Lesser, John A. MacGruer.

Darvin and Scharlin were sentenced to six months in jail. Similar sentences on the other individual defendants were suspended.

Plant Re-opens

The Newport Company has re-opened its naval stores plant at Bay Minette, Birmingham, Alabama, after a shutdown of more than a year. About three hundred men will be given employment by the resumption of operations.

Charles K. Davis, formerly president of the du Pont Viscoloid Company, has been elected a director of E. I. du Pont de Nemours & Company and president of the Roessler & Hasslacher Company.

Arnold E. Pitcher will succeed Mr. Davis as president of du Pont Viscoloid.